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VIEWS, NEWS AND INTERVIEWS.

Mr. Palmieri, in *La Lumiere*, describes an apparatus for collecting atmospheric electricity. It consists essentially of a revolving wheel having eight spokes, but no rim; each spoke is made of a conductor insulated from the hub and having a small metallic cross-arm at its farther end; near the hub are arranged two brushes, one above and one below the center; these brushes are always in contact with the spokes pointing vertically upward and vertically downward, respectively, during the revolution, and, therefore, lead off from them the electric charges collected from the atmosphere at the top and at the bottom of the wheel; the brushes are connected by wires to two Leyden jars and to sparking knobs, as usual.

Professor Wiggin believes that telegraph wires cause drought, that the atmosphere cannot absorb moisture unless it is charged with electricity, and that upon an oblate spheroid like the earth the electricity will invariably collect at the equator. In this way he explains the frequency of rains at the equator. "If, however," he says, "there be elevated spots on a sphere, electricity will collect on them. Should these spots or continents be connected by wires, it might accumulate on each alternately. This has happened this year, and America has all of the electric energy and Europe has lost it; so that our continent is flooded and Europe is burned up with drought." His conclusion from all this is that electric wires should be buried.

The General Electric Company has decided to shut down the iron foundry of the Thomson-Houston works at Lynn after this week, claiming that castings can be purchased of local foundries cheaper than the company can make them. The iron foundry has but recently been started, and employs 275 men, 150 of whom are molders. The steel foundry is not to shut down.

It is estimated that the average net earnings of the electric lamps in London is about 10 shillings each a year.

In June the electric car mileage of the West End Street Railway, Boston, was 1,328,528, while the horse car mileage was 287,000, or less than 18 per cent. of the total mileage. By January 1 it is expected that the electric car mileage will be nine-tenths of the whole mileage.

The manufacture of the new cable to be laid between Lisbon and the Azores was begun on June 19. It will be laid in September, and is expected to be in full working order by the middle of November. The cable is considered of meteorological importance, as the Island of Flores, the nearest point to the Gulf Stream, will be put in direct communication with Europe.

The popularity of the electric fan has been greater this year than ever before. Next season fan manufacturers look for a tremendous business. Judicious advertising is credited with causing this season's large sales.

A TRIP TO THE WORLD'S FAIR.

INCIDENTS OF THE JOURNEY—FIRST VIEW OF THE WHITE CITY—INNOCENCE OF THE COLUMBIAN GUARDS — THE ELECTRIC FOUNTAINS—A TRIP OVER THE GROUNDS —DON'T MISS SEEING THE FAIR.

Westward, ho! for Chicago. The dusky guardian of our comfort shouts "all aboard," and with a little flourish he mounts the car platform and we speed on our way in one of the magnificent Wagner palace cars of the New York Central Railroad for the White City. Half an hour's travel is past and a violent rain storm overtakes us. Vivid flashes of lightning dart athwart the sky, and every now and then a sharp crash is heard, which tells of the destruction of some natural or artificial lofty structure. All of a sudden a sharp crack is heard, a

VIEW AT THE WORLD'S FAIR, SHOWING THE ELECTRICITY BUILDING AT THE LEFT, THE MCMONNIES FOUNTAIN, THE TWO ELECTRIC FOUNTAINS, AND THE GREAT MANUFACTURES AND LIBERAL ARTS BUILDING IN THE BACKGROUND.

mighty monarch of the forest falls across the track, and some of its branches crack over the engine, doing damage to the boiler. A delay of two hours is caused, owing to the fact that telegraphic communication with New York is broken by the storm.

Dinner is served in the well equipped dining cars, and we wait patiently until our new engine arrives.

The occupants of the car are interesting. A family composed of three or four children and solicitous parents, and a young married couple immediately behind me, make things very lively for the other occupants of the car.

Fellow feeling makes one enter into the true conversational spirit, while voluntary prisoners in these traveling parlors, and in a confidential way the young benedict informs me that this is his honeymoon. How useless!

We get off to the subject of electricity, and the question of car illumination is brought up. He seems to think that the cars are bright enough already. Why shouldn't he?

The shadows of night have fallen so quickly that the time for retiring comes, and we watch the porter with a great deal of interest as he makes up our berths.

"Mamma," says the little girl behind us, "don't his fingers look like chocolate drops on a marble mantel-piece?" The simile is correct. The young couple blush, I don't know why; but she titters and says that they look more like chocolate éclairs.

These little incidents tend to brighten up the trip and make the very pleasant ride still more so.

Suddenly there seems a general movement in the direction of the car berths, and in a short while no one is to be seen. Then come a few subdued expressions from the different berths, and we realize that the darkness caused by the curtains is producing some little inconvenience. As one of the number, I experience my share, and with a few concealed expressions, which it would be better not to mention, I think that it would be a very good idea to supply each berth with an incandescent lamp, supplied with current by means of any thoroughly reliable system of train lighting.

Next morning has come. I look out of the window and see the thread-like Erie Canal, patrolled by lazy mules and still lazier attendants. What an improvement and advantage, think I, the introduction of the trolley on the canal will be for everybody concerned.

Shortly Buffalo is reached, and a little red trolley car trundles along and reminds us that we are once again in civilization. Then comes an adjournment to the dining room, and the train soon reaches the greatest natural wonder in this country. Niagara Falls in all its grandeur is here seen. Quite varied are the expressions from the different passengers. I approach the young couple to see what they think about it. Their views have been unique on every subject, and I am anxious to see whether this magnificence will astonish them in any way. I came near them, and of course anything is an intrusion to them. Still I venture an inquiry, and there naturally follows some reference to their newly acquired happiness. "My!" she exclaims, "what a great big bridal veil that would make." I see the case is hopeless, so I leave them to their silent admiration.

The little Maid of the Mist plies unceasingly and dangerously near the Falls. Everything is enveloped in a mist, and it is difficult to discern particular objects. All recognize the vastness; its height is not so astonishing. Taughhannock Falls, in the central part of New York State, is 50 feet higher, but it is the great volume of water which pours over these massive rocks which gives grandeur to the Falls.

I take a few photographs, the whistle blows, and we soon are on Canada soil in the equally sumptuous cars and on the splendid track of the Michigan Central Railroad. The formality of inspecting our baggage is not gone through with, and we proceed through miles of well cultivated fields, laden with rich odors, similar to the fragrance of the celebrated muscatel grape.

Finally Detroit is reached. Our train is split up into three sections as it crosses the Detroit river, and the scene of the city spread out before us is rendered broader, not that it is a large place, but the widely dispersed steel electric light towers give distance, and seem hardly adequate for sufficient illumination.

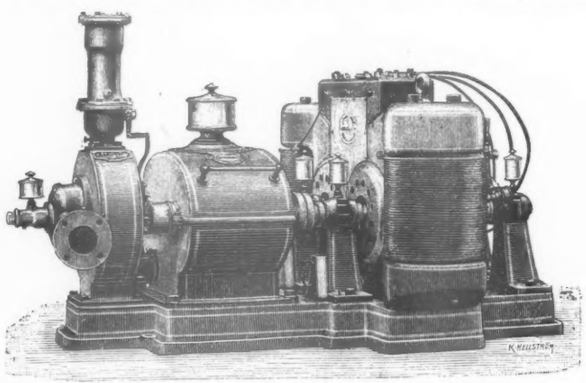
We pass the celebrated Battle Creek, and a very large sign tells the passers of the many advantages to be found within its limits.

Night again comes, and we arrive in this city of Chicago. It was not at all difficult to find accommodations, for we immediately secured lodgings in a hotel very near the Fifty-seventh street entrance to the Fair Grounds. How impatiently did I wait for the breaking of the morrow's sun, that I might feast my eyes upon the White City—for a feast indeed it is.

THE GREAT WHITE CITY.

Following the immense throng into the grounds, we soon reach the broad streets, lined on either side and every side with these temporary monuments, illustrative of what American ingenuity is capable. The impressions of a stranger in the White City must necessarily be interesting. Let me see what mine are.

The first thing that strikes me before I attempt to look at the buildings is the remarkable predominance of the female sex. It seems as if all the schools of the country have let loose their teachers, who with one accord have swarmed to the Fair. Their independence is remarkable, and one would think that Susan B. Anthony would have her heart throb with pleasure at the sight of these, her mild followers.



THE DE LAVAL STEAM TURBINE AT THE WORLD'S FAIR.

I have a definite object in view. I want to reach the Electricity Building with all possible speed, and I seek information. Unfortunately I neglected the purchase of a guide book upon my entrance. I question a guard. His innocence concerning questions relating to the World's Fair is childlike and bland. One might think he recently arrived from Timbuctoo, or some other place equally remote. He directs me to the Electricity Building in a vague, opium-eater style, and I feel positive that he has given me the wrong direction. So he has. I question another guard. He betrays a little more intelligence, but he really doesn't mean to. I suppose it isn't his fault. He tells me that the Electricity Building is about seven blocks down. "Ah," think I, "seven blocks is possibly about half a mile." Woe to the person who persists in this delusion, for the blocks in this city are nearer to one thousand feet in length. Everything is so vast, and the prices inside the Fair ground keep pace in their desire to be appreciated as something vast. After an hour or so's tramping around, I reach the home of the electricians. Like the other exhibition buildings, it is overwhelmingly magnificent. There is no use to attempt to describe these astonishing and bewildering immensities of architectural construction. One has to choose the largest words to attempt to approach anything like an account of what they are. There is no use to try it; it would take a Gustave Flaubert or a Rider Haggard to attempt it.

I wander aimlessly around, not knowing where or what to look at. A superficial observation is all that can be made, and I begin to realize that if I want to even look at the Fair I will have to spend all the time during which it will remain open, and even then I will have failed to see one half the things therein contained. Nobody can appreciate its intricacy. It is a city of stupendous palaces, such as never before existed. The architectural and artistic decorations are the best products of the best artists. Illustrations of any sort, whether photographs or paintings, utterly fail to give one who has not the good fortune to be here any idea of what it is.

THE ELECTRIC FOUNTAINS.

All its illuminations are dependent upon electricity, and they are something superb. Our illustration represents a view taken from Machinery Hall, showing the lagoon, the celebrated McMonnies' Fountain, and the two electric fountains. The appearance of these fountains in the daytime is not of an ornamental character, but when they play during the evening, and are illuminated by the multi-colored arc lights, over which the streams spray in fleecy clouds, the irridescent hues produced rival glitterings of showers of gems. By an ingenious arrangement the colors are constantly being changed, and it seems as if rainbow after rainbow is projected with varying intensity into the mass of glistening clouds. The illumination of the buildings around the cornices, and at the borders of the lagoon and the peristyle gives an added beauty to the structures. An immense concourse of people sit in every available place and watch the play of these dazzling streams of water.

Only expressions of the highest admiration are heard, and well are they deserved. But it is wrong to spend too much time on any one scene of magnificence. The hours have to be husbanded, and carefully appointed for looking at selected exhibits. It is impossible to see everything, and daily itineries which may be purchased on the grounds, in a poor kind of way, tell the bewildered individual what he should look at. What an education the whole thing is, and what a pity it is that it is not to remain open forever.

The wonders are so distributed that I begin to realize my want of foresight in not bringing a pedometer, so that I might point with pride upon my return to the many miles traveled. But that is past; I shall continue to walk and look. My first time shall be spent in the Electricity Building, where it seems as if each exhibitor is trying to rival his neighbor. The main features of this department are the central electric light tower, the wonderful exhibits of the General Electric, the Westinghouse, the Brush, the Bell Telephone, the Western Electric and other prominent companies—a grand historical museum. One feels as if he is in the presence of the genius of progress and development, all the exhibits are so tastefully and thoroughly constructed. The French and German sections, which comprise mainly a grand assortment of instruments of precision, rival in point of workmanship the products of England and the United States. Devices of which few have heard are here shown in their entirety. The workmanship is delicate and perfect. One could scarcely imagine better construction. Minor exhibitors show products of their manufactures in most elegant style, and the whole is a sight which one should travel any distance to see. Such a chance may never occur again.

A TRIP OVER THE GROUNDS.

Let us leave, however, these technicalities and wander as our fancy guides us over the grounds. In every place one sees evidence of the utilization of electricity. Throughout Machinery Hall motors are extensively used. The majestic Allis engine furnishes power for the monster Westinghouse multipolar generators. Additional power and current are obtained from several direct coupled Westinghouse engines and dynamos. One of them, comparatively slow speed, makes two hundred revolutions a minute. The others are very much faster. I notice that small brushes are used and the commutator is divided up into sections. Throughout the entire hall electricity is applied everywhere. One remarkably ingenious machine, the de Laval steam turbine wheel, illustrated herewith, is astonishing for the fact that five horse-power of energy is conducted on a three-eighths inch steel axle. Great speed is obtained, as high as 22,000 revolutions per minute. A very simple and effective expanding tube governor controls the steam supply, and between the turbine and the dynamo is a set of brass gear wheels which reduce the speed to about 2,000 revolutions at the dynamo. The inventor, who is the inventor of the celebrated cream separator, intends to construct a direct coupled turbine and dynamo to run at about 30,000 revolutions.

Let us wander out of the Machinery Hall and get into the mazes of the Mining Building. Here are the priceless exhibits having intrinsic values. Masses of gold and silver ingots are lavishly displayed; huge copper exhibits tell of the wonderful facilities for the production of this metal, so useful to the electrician. Houses are built of copper tubes; monuments of coal and iron, and the celebrated Rehan statue, constructed of silver and gold, all tell of the wonderful mineral resources of this country. The other countries of the globe are not to be outdone. The Kimberly Diamond Mining Company have an extensive exhibit of their diamondiferous ores and processes for the extraction and cutting of this gem. Germany, France, England and Sweden all contribute to these magnificent displays. Years could be spent to great advantage in studying all these processes. Out from the Mining Building must we go, and the Fisheries Building attracts our attention. What wonders are herein contained. Monsters from the deep swim quietly before our eyes, and we can study their habits uninterruptedly.

The numerous State buildings vie with each other in the magnificence of their exhibits. It is one complete round of bewildering grandeur.

Outside of the Exposition Grounds is the adjunct called the Midway Plaisance, containing exhibits of the manners and customs of the Oriental and African natives; and, rearing its majestic framework above everything else, stands the magnificent Ferris wheel. This is indeed a wonderful piece of work. Freighted with its load of human beings it slowly revolves, affording an uninterrupted view of the surrounding country.

The recent destruction by fire of the Cold Storage Company's building has been a slight damper on the enthusiasm of the multitude, many lives having been lost in its ruins. Yet, withal, the swarm of people crowd the buildings and drink in to their hearts' content these wonders of the nineteenth century. Come one, come all! It is the chance of your lifetime; don't miss it; make every sacrifice to see the Fair, and you never will regret having seen this grand Exposition and collection of the wonders in nature, art and science of the many countries of this mundane sphere.

JULIAN A. MOSES.

The Page Belting Company at the World's Fair.

One of the most prominent and important exhibits in Machinery Hall is that of the great Allis engine, the two 10,000 light Westinghouse generators and the two leviathan belts that run from the 30 foot fly-wheel of the engine on to the generators.

It certainly was an experiment to attempt the transmission of 2,000 horse-power through two belts running tandem, that is one lying upon the other, in the way this

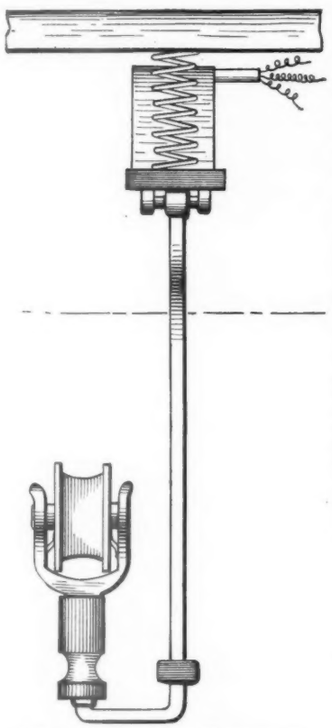


FIG. 1.—VERTICAL END VIEW OF THE HIEATZMAN TROLLEY.

transmission is accomplished. In the judgment of many engineers it was a very doubtful experiment. Indeed, the predictions were by no means few that the effort must of necessity prove a failure. The mammoth engine, the largest of its type, is an achievement worthy of the house that makes the exhibit, namely, the E. P. Allis Company, of Milwaukee, but it is a demonstration of large facilities on the part of the makers rather than any proof of successful experiment, because it is not an experiment at all.

The large Westinghouse generators are not new, the construction of generators of this size having already passed the experimental stage. At first it was proposed to construct a fly-wheel 13 feet in width with the surface so shaped that two enormous belts, each 72 inches wide, might be run side by side on to generators set in the same order; but later it was determined by the builders of the engine, and the Exposition engineers, that the two belts should be run upon the face of a pulley 76 inches in width; one belt running upon the other, the machines being set tandem. This required one belt 72 inches wide, 148 feet in length, to drive the nearer generator, and the other belt 71 inches wide, 184 feet in length, to drive the further generator. It required much courage to furnish belts for such an installation, but the Page Belting Company, of Concord, N. H., was equal to the task. With their new works recently completed, containing heavy machinery of the latest and most approved patterns, including the largest hydraulic belt press ever made, producing the enormous pressure of 660,000 pounds, the two leviathan belts were built and thoroughly tested upon special testing machinery owned and operated only by the Page Belting Company, before they were sent from their factory. In due course they were properly installed in their places, and now they are transmitting from 1,000 to 1,200 horse-power each, the two producing more than 20,000 incandescent lights. They are driven at a speed of 5,600 feet per minute and run as true as a die. There is no perceptible wabble, vibration or flap. They are 3-ply in thickness and all together weigh more than three tons. They are waterproofed by a special method, containing no oil or acid, which gives a surface to the belts which enables them to lie right upon the pulleys with most perfect contact, and thus the belts running slack transmit the enormous power above mentioned. These belts have never been touched since they were put on the pulleys, and have every promise of running through the Exposition without being taken up or altered in any manner whatsoever. It may fairly be considered as the greatest achievement in the art of belt-making that has ever been accomplished in the history of the business, and it forms a very attractive and effective exhibit.

The Duplex Street Railway Track Company Assigns.

The Duplex Street Railway Track Company, a West Virginia corporation, whose office is at 51 Wall street, New York, made an assignment last week to John D. Elwell, without preference. The Duplex Company was organized by Mr. Elwell in June, 1891, with a capital stock of $1,500,000. Some of the directors were Carl Schurz, R. L. Edwards, president of the Bank of the State of New York; William H. Male, president of the Atlantic Trust Company; F. V. Greene, president of the Barber Asphalt Paving Company; and George Coppell, of Maitland, Phelps & Company. Mr. Coppell became president, with Mr. Male as treasurer. The company has large contracts of laying track at Steinway, Camden, Baltimore, New Orleans and Fort Wayne. It laid the Fourth avenue track in this city. The liabilities are a trifle over $100,000, and the assets about the same.

A New Underground Trolley System for Electric Street Railways.

BY A. H. HIEATZMAN.

This system illustrates the feasibility of a practical operation of the overhead system placed underground and, while being as simple in construction and operation, its virtues eliminate all the serious objections

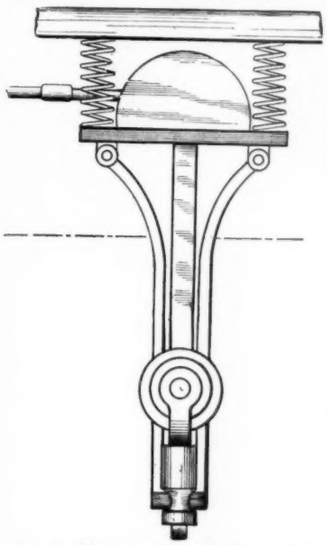


FIG. 2.—VERTICAL SIDE VIEW OF THE HIEATZMAN TROLLEY.

so strenously put forth against the overhead system.

To equip a double track road only one conduit is used, instead of two, it being placed in the middle (crown) of the street, between the two tracks leading in opposite directions, utilizing that narrow strip of street which has no other use than that of space. This, in the first place, greatly reduces the cost of construction. The conduit is susceptible to the least street drainage, and the slots are in a manner out of the way of local traffic. Also, on reconstructing the overhead system to this system the conduit is entirely independent of the tracks and can be constructed without disturbing or relaying the same, thus saving the existing tracks. The conduit can also be placed between two existing tracks of any cable road, and the cable and electric systems can be operated in conjunction along the same street without interfering one with the other. To clean the conduit no mechanical means are required, simply a pipe connection with the city water supply pipe to flush the conduit during the hours after the cars are done running and clean out all accumulated foreign matter that may drop through the slot openings. Ordinarily the conduit will be three feet deep, and can be constructed of any suitable material, such as masonry, brickwork (preferred), concrete, etc.

In places where the drainage is imperfect, then the conduit will be of sufficient depth necessary to carry off the surplus drainage.

Another important feature, the conduit along the route of the track may be leased to the municipal authorities for their fire alarm wires and also to the various electric light, telephone and telegraph companies for their wires without interfering with the operation of the electric road. It being of easy access through the manholes, renders it adaptable for this purpose and readily commends it for such usages.

There are two slots, one on each side of the conduit, so that the trolley arm (which has been specially designed for conduit usages), may extend down from the side of the car at the bottom into one of the slots of the conduit to receive its current.

A most peculiar and important feature regarding this system is the impossibility of the slots to freeze shut (the one great obstacle in all other slotted conduit systems is that during the winter time the yokes contracting from the cold close up the slot openings). In this system the contraction of the yokes has a tendency to widen the slot openings instead of closing them.

All mechanical and electrical difficulties of construction, insulation, etc., have been met and overcome in the conduit trolley for this system. This device is fastened on the side of a car and consists of a trolley wheel journaled in the arms or prongs of a fork, which is embraced by a stout structure of rubber. This is of sufficient rigidity to hold the trolley wheel in contact with the conductor, but at the same time flexible enough to take up the jar or sidewise movement from any cause; this rubber structure at its lower end embraces the toe of the trolley arm, which is constructed of two grooved pieces, secured together, forming a complete envelope for insulated wires, which also pass through the rubber structure and have uninsulated ends to engage the trolley; thus, as described, the insulation is perfect from the trolley to the motor on the car, and there is practically no chance of accident from exposure to the current, or possibility to short circuit.

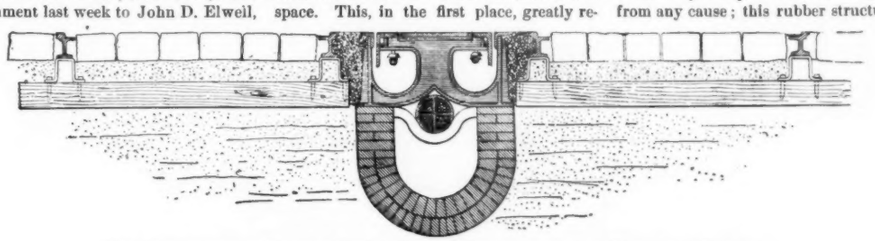


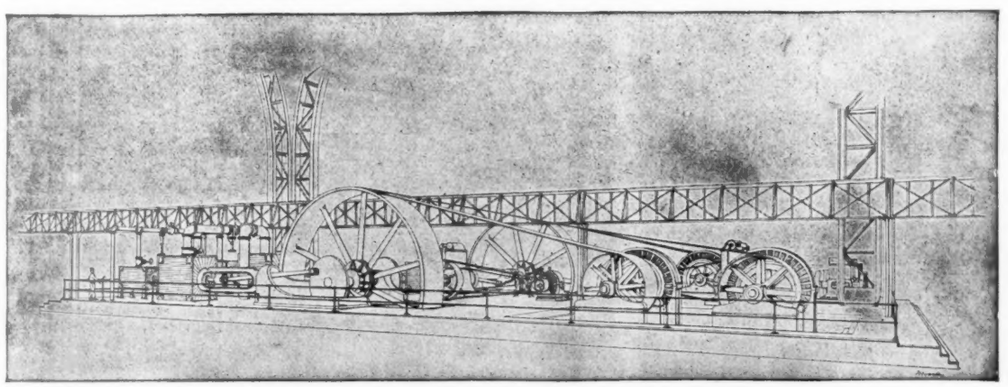
FIG. 3.—SECTION OF DOUBLE TRACK ROAD EQUIPPED WITH THE HIEATZMAN SYSTEM.

The trolley arm is made as narrow and light as possible, and to stiffen and strengthen it braces are secured to its lower portion, which pass up in forward and rearward inclined positions through the slot in the conduit, their upper ends being provided with eyes, which embrace transversely secured rods on the spring-supported platform. The transverse movement of these braces on their top supporting rods allows them to pass freely around curves in the slot.

The conductors along the line, from which the motors draw their supply of current, consist of steel rails on insulators, specially made so as to secure a high conductivity, their ends being electrically joined together. These rails are many times larger in sectional area than the wires used in the overhead construction, and their relative capacity to convey electricity is many fold greater than such wires, thereby obviating feed wires. The return circuit is completed through the track rails (as in the overhead system).

Where a single track using this system, or where a double track diverts to form a loop, the construction of the conduit will be substantially one-half.

This system is the basis of a number of patents issued to the Messrs. Hieatzman Bros., of Baltimore, Md.



THE MONSTER BELTS OF THE PAGE BELTING COMPANY CONNECTING THE GREAT ALLIS ENGINE AND THE IMMENSE WESTINGHOUSE GENERATORS AT THE WORLD'S FAIR.

Westinghouse Electric Railway Apparatus.

Although the Westinghouse Electric and Manufacturing Company has been in the electric railway field but a comparatively short time, their apparatus and equipment has achieved an enviable reputation, as is attested by the large number of roads already installed by them. In the electrical design of the Westinghouse apparatus high efficiency is combined with thorough insulation and good workmanship—a union without which the economical operation of an electric street railway would be impossible.

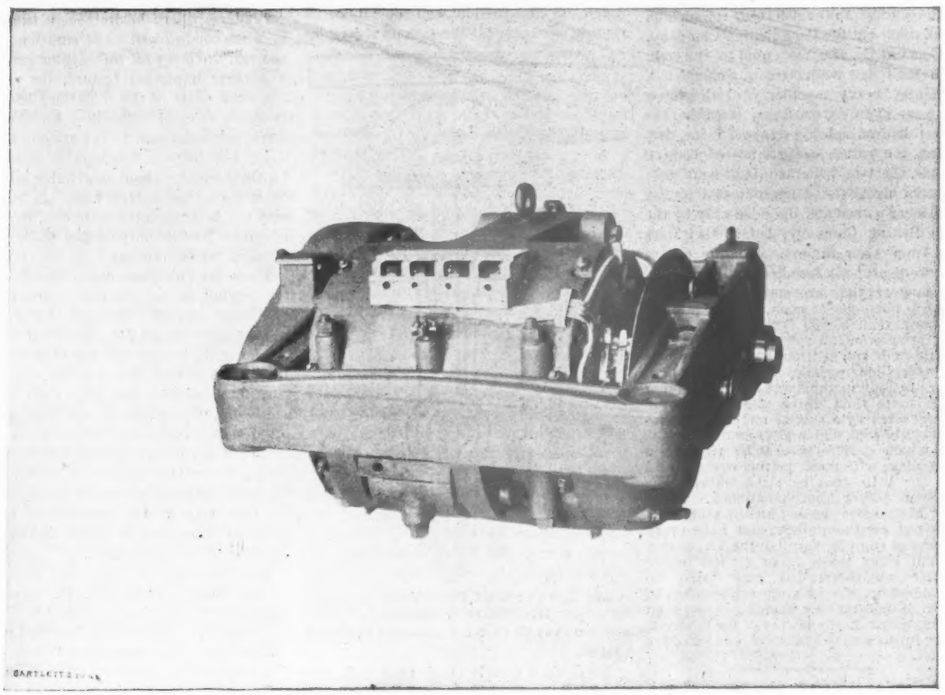


FIG. 1.—WESTINGHOUSE NO. 3 SINGLE REDUCTION RAILWAY MOTOR.

For ordinary street car work the Westinghouse Company manufacture standard single reduction railway motors of 20, 25 and 30 horse-power. For the heaviest work they build motors of 40 and 50 horse-power and larger, either slow or high speed. In Fig. 1 is shown the No. 3 single reduction railway motor. The lower part of the motor is entirely shut in, thus completely protecting the armature and field coils from moisture, snow and dirt, and making the use of pans and curtains unnecessary.

The motor has four pole pieces, which project radially from the interior of a cylindrical yoke. Formerly engineers were divided in their opinions as to the relative merits of four-pole and two-pole motors, but latterly the advantages of the former type are being recognized, for the four-pole field is lighter than the two-pole, and offers a shorter path for the magnetic lines of force. It also allows the use of a circular yoke, which gives the greatest mechanical strength, and is lighter, for a given cross section, than any other form. The Westinghouse motor, combining, as it does, the multipolar field and the two-circuit armature, embraces the important advantages of both types of machines. The field coils are separately wound on lathes, thoroughly insulated, and then slipped over the pole pieces, and held in place by flat brass rings bolted to the yoke. The yoke is in two parts, divided by a horizontal plane through the armature shaft.

The cast iron frame in which the motor is mounted is a distinguishing feature of the Westinghouse motors. This frame is rectangular, in one casting, and made sufficiently strong to withstand the greatest strains. It extends entirely around the motor, and is suspended at two corners on springs, which distribute the strains and prevent abnormal wearing of the bearings. By means of the frame the armature shaft and car axle are maintained in perfect parallelism, and consequently perfect meshing of the gears is assured. Easy access to the field coils and armature is secured by the hinged arrangement of the fields. To remove a field coil the upper half cylinder, or the lower half, as the case may be, is swung back, the coil unbolted and slid off its pole piece entire without molesting its windings.

The Westinghouse street car diverter, shown in Fig. 2, consists of a small wrought iron frame, containing coils of flat iron wound compactly between sheets of mica. The function of the diverter is, primarily, to reduce the current on starting, so that the car may be easily and gradually gotten up to speed and the motors saved from sudden and injurious jerks; but, furthermore, the diverter allows variation in the speed of the car, and permits slow running through crowded streets. The frame containing the coils is secured under the car body where it is not seen, and being strong, simple and fireproof, it requires no attention other than the occasional inspection of its connections.

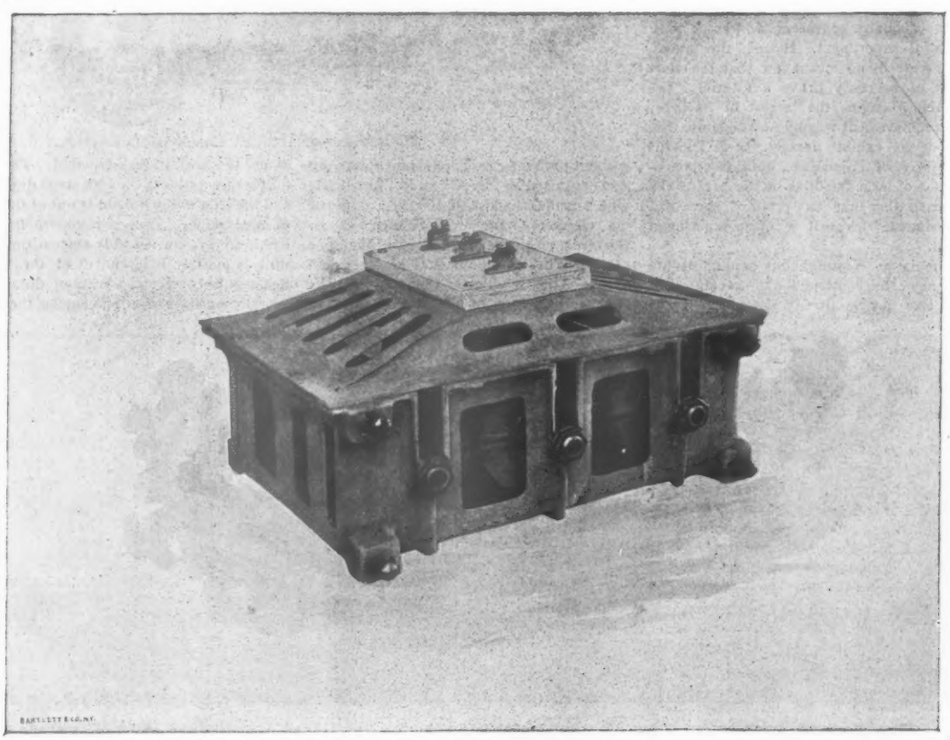


FIG. 2.—WESTINGHOUSE STREET CAR DIVERTER.

The generators manufactured by the Westinghouse Electric & Manufacturing Company are designed to be either belt-driven or direct-connected to the shaft of the engine. They are self-oiling, self-exciting, perfectly self-regulating, and, after being started, completely self-attendant.

The railway generators are wound for a nominal voltage of 500, but, having a rheostat in the field circuit, the potential can be raised to 600 volts without undue heating, and even 50 per cent. over-loads will be borne for short periods without injury to the machine.

Before shipping, every generator is set up and run under conditions similar to those it is intended to meet in actual practice, and no machine is allowed to leave the factory unless enduring tests of its mechanical and electrical perfection.

A distinctive feature of the Westinghouse generator is the construction and winding of the armature. The two-circuit winding and all the other marked advantages of the Westinghouse motor armatures have been adopted with slight modification in the multipolar generators. The core is built up of thin disks of soft iron, punched around their circumference with oval holes. The disks are then properly insulated, forced together under pressure, and rigidly keyed to the shaft. The oval apertures being superimposed one above the other, result in forming grooves which extend parallel to the shaft the entire length of the armature. In every groove are placed tubes of insulating material, through each of which is run a stranded cable, or copper wire.

In the present form of armature, shown in Fig. 3, each wire is thoroughly protected by insulating material, and then rigidly secured *beneath* the iron, so that there is absolutely no possibility of its coming loose or making contact with another wire. The winding is of the simplest form possible, as each coil consists of but a single loop of wire. The simplicity is particularly noticeable at the ends of the armature, where the wires, instead of being overlapped and bunched together, stand out from the core and from each other, thus allowing free circulation of air around every conductor. No wires, having a large difference of potential, are adjacent to one another.

The necessary voltage is secured by revolving a comparatively small number of coils of wire in a powerful magnetic field, rather than by using a large number of coils and weak field. The small amount of wire on these armatures accounts, in great measure, for the absence of sparking at the brushes, and the fixed position of the points of commutation under variations of load. No matter how great the current in the armature conductors the field is always powerful enough to overcome the effect of their cross-induction, and consequently the lead does not have to be changed.

The commutator is designed on truly mechanical principles. It is long and massive, affording ample contact for the brushes. The segments are of the purest copper, carefully insulated from one another by the best quality of mica. Owing to the simplicity of

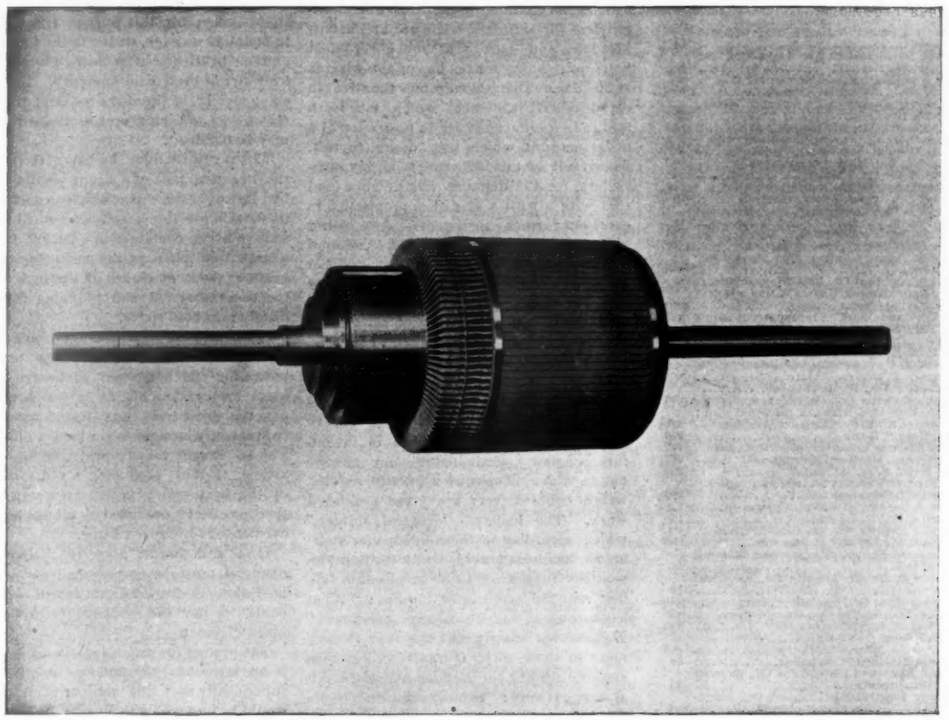


FIG. 3.—WESTINGHOUSE MULTIPOLAR RAILWAY GENERATOR ARMATURE.

construction, the orderly arrangement of the wires at the ends, and the absence of all bands or binding wires on the surface, the finished armature presents the attractive appearance shown in Fig. 3.

Fig. 4 shows a portion of the winding room in the Westinghouse factory, and illustrates the ease and simplicity of winding the armature just described.

A Strike in the Filament Department of the Edison Lamp Works.

Work was resumed in the Edison Lamp Works, at Harrison, N. J., on July 17, and on July 19 there was a strike in the fiber room, where the filaments for the lamps are prepared. When the girls were leaving the shop on Monday evening they saw a new placard upon the wall. It was a notice of a material decrease in wages for piece work. The reductions were from 35 cents a thousand for one grade to 25 cents. In another grade they were from 25 cents to 16 cents, and in another from 25 cents to 12 cents.

Fifty-three girls left and the fiber room was practically emptied. One of the girls said that this was the second reduction within three months, and that at the new rates they could not earn a living. They could make only $5 to $7 a week by hard work at the old rates. She said she had heard that the company had been instructing a lot of Polish girls in a room in Newark for some time in view of the reduction of prices and a resultant strike.

General Manager Francis R. Upton said to a reporter that the reduction had been made after careful consideration, and was made necessary by competition with other lamp makers, who had adopted new processes by which lamps could be made cheaper than at the Edison works.

The United States Factory Closed Down.

On July 17 the United States factory at Newark, N. J., operated by the Westinghouse Electric and Manufacturing Company, was closed down, and 400 men were temporarily laid off. It is said that the company intends consolidating all their works at Brinton, in the outskirts of Pittsburgh, and that soon the Newark plant is to be removed to that place.

Curious Effect of Arc Lights on a Tiger.

Every evening at 8 o'clock, in the Midway Plaisance, at the World's Fair, is given a most interesting exhibition of tamed wild animals owned by the celebrated tamer Carl Hagenbeck. Last week during the intense heat, which used no discrimination whatever in the way in which it affected man and beast, a most startling incident occurred which cannot be recalled without a thrill and a certain feeling of horror.

The announcement was made that Miss Marcella Berg would exhibit her collection of trained animals, consisting of lions, tigers, boarhounds, bears and several domesticated quadrupeds.

The young lady entered into the middle of the large arena cage, made her bow, and, as the glittering arc lights shed their bright rays upon her slight figure and smiling face, few thought how different would be her exit but two or three short minutes afterwards.

Of a sudden the gates of the cages are thrown open, and the first to make his appearance is a large tiger, who crouches as he enters, uttering a few low ominous growls.

It is his first appearance under the arc lamps, and their dazzling rays affect him strangely. Somehow he cannot reconcile himself to his surroundings.

The other animals enter, and more or less quietly go to their respective appointed positions.

The new tiger, but eighteen months in training, slinks and sneaks around the trainer.

He looks at her in a strange way. She has changed her costume and he does not recognize the pale green satin trousers.

Miss Berg approaches him and attempts to give him a gentle pat by way of admonition. The surly beast puts forward one paw and with his extended claws slightly tears the offending satin.

The heat makes the animals pant from sheer exhaustion, and this sullen animal, the most treacherous of all the wild beasts, has a ferocious glitter in his cold, hard eyes.

The trainer feels a little uncertainty and the tiger notices it. Woe to the one who enters a cage of wild animals who does not make them aware of his superiority!

She approaches still closer, perhaps to proffer him some sugar, when, like lightning, the savage beast springs upon her and throws her to the ground.

Instantly his cruel fangs dig deep into the tender flesh above the knee. Her screams from intense pain and fright are heartrending, and we expect every moment to see a living picture of the horrible games of ancient Rome, when slaves were offered to wild beasts for the pleasure of the multitude.

As soon as possible, hours it seems, in reality but a second or two, the attendants are upon the tiger, and the fight is between men and beast.

With a savage growl, dazzled by the many arc lights, he clings to his victim, while blows from heavy whips in the hands of Mr. Heinrich Mehrmann and his assistants rain thick and fast upon his tough head and body.

Finally a strong pair of arms seize the unfortunate female. The tiger has unwillingly relinquished his hold.

She is carried screaming to her dressing-room, and a short while afterwards four deep wounds are attended to at the Emergency Hospital on the ground.

Outside of the cage the scene is like pandemonium let loose. Women and children scream, men turn pale and make a wild rush for the exits. Three women faint and are carried out; meanwhile the other animals in the large cage have become uneasy, and it requires a strong mind and hand to control them.

A few well directed blows quell the disturbance and all proceeds quietly.

The performance continues, while away from the spectators lies the wounded woman on a bed of pain, a victim of unfortunate circumstances.

All this is for the edification of our public. The element of danger is what attracts the morbid multitude, and we, chance spectators, saw in a partial way what the individual in Eugene Sue's "Wandering Jew" followed the circus for years in order to see —the destruction of the lion tamer. "M."

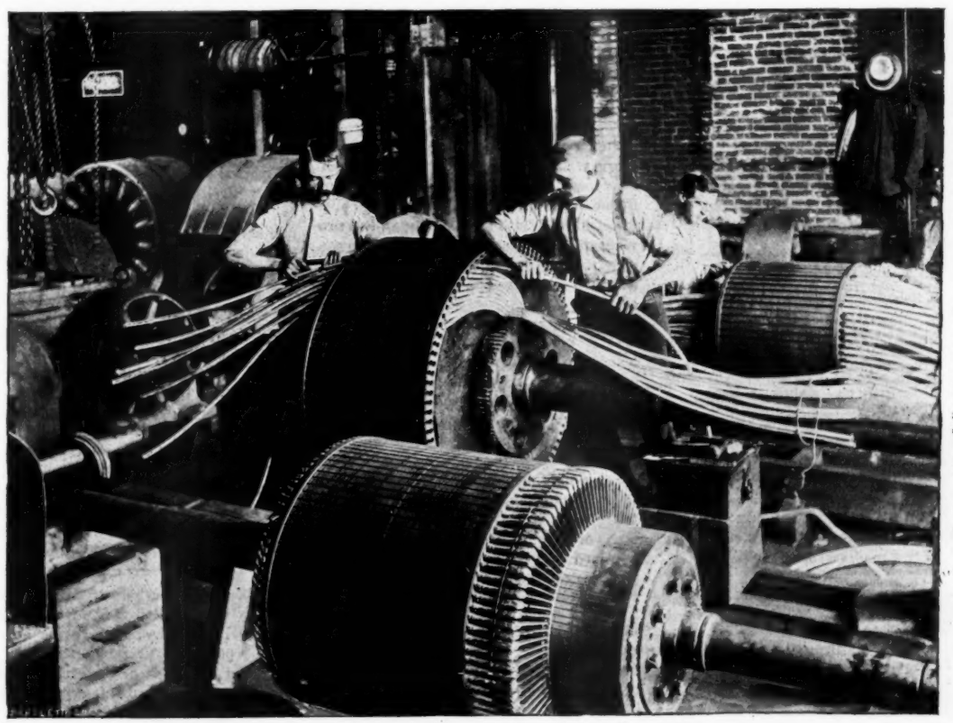


FIG. 4.—WINDING A WESTINGHOUSE MULTIPOLAR RAILWAY GENERATOR ARMATURE.

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"I consider the ELECTRICAL REVIEW the best of its class and greatly prefer it over all its contemporaries," writes a Baltimore electrical engineer of discernment.

From one standpoint the defeat of the Electric Manufacturing Company, of Oconto, is a good thing. Now that the Edison Company has been granted an injunction, the defendant can appeal to a higher court and arrive at a final decision sooner than would be the case if the injunction had not been granted.

Commissioner of Patents Seymour has rendered his decision in the investigation of charges against his predecessor, ex-Commissioner Simonds, Messrs. Foster & Freeman and Chief Clerk Bennett, which, as foreshadowed in the ELECTRICAL REVIEW when the case was first made public, completely exonerates all the parties concerned, and entirely relieves them of any suspicion of wrong doing.

Is it possible that the marked resemblance—as a caricature resembles the original—which Seabrooke in the last act of the "Isle of Champagne" bears to Lord Kelvin (Sir William Thomson) is merely a coincidence, or a copy after some other person who attracted the notice of the comedian? It is beyond the bounds of probability that the eminent electrician was ever the original for this grotesquerie, and the whilom monarch of the "Isle of Champagne" is absolved from any discourteous impersonation.

We advise our electrical friends from out of town who may visit New York during the hot season not to forget to make a trip to Coney Island during their stay here. A delightful sail down the bay, a morsel of food and drink at Manhattan Beach, a good cigar, a stroll by the sea, an hour of Sousa's delightful music, a quick trip back by train, and all this between five o'clock and midnight. We unhesitatingly offer this receipt as one of the pleasantest cures for business worries, the effects of a hot day or the blues. If we have any adverse criticism to offer, it is that one dose is not enough.

FRENCH HUMBUG.

A rather amusing paragraph appears in the *Revue Internationale de l'Electricite* of July 1, 1893. Under the title "Les ballons dirigeables," the journal attacks the French War Department, and especially that division of it devoted to the practical use of the balloon for military purposes. The headquarters for aerostatic trials are at Chalais-Mendon, and each year the government votes quite a sum for the use of the wizards at Mendon. This is done upon the strength of an official statement which sets forth that the experimenters are in possession of a novel aerostat which they desire to test. The result of this little ruse is highly satisfactory, for the deputies vote at once (and that with a will) a special appropriation to carry out further experiments. As a matter of fact, when the year has passed, it is found that nothing has been accomplished, and that the French War Department is still hunting for a governable balloon. In connection with this airy question, the journal calls attention to another trick which has been successfully worked by the Mendon people. Recently the Parisian journals have made the startling announcement that at the military station at Mendon the experimenters had at last succeeded in inventing a new accumulator and electric motor, which, in spite of a greatly reduced weight could do very heavy and prolonged work. The balloon, "General Munier," which, according to these newspaper statements, had been provided with the latest inventions, turned out to be an absolute failure, and the people now inquire: "What has become of our liberal appropriations?" *L'Electricien* bluntly asks the War Department to show what, *if anything*, has been accomplished by the Mendon officials, and it at once answers: "Absolument nuls"—absolutely nothing! And anxious for the high reputation of French science, *L'Electricien* requests the government in future to prevent the Mendon people from purposely deceiving the French nation and throwing discredit upon French electricians.

M. Brown Sequard has recently addressed a communication to the French Academy, in which he describes an important discovery of M. d'Arsonval. It has generally been assumed that the electric excitability of muscles ceases shortly after death. This statement is true as far as their ability to contract is concerned; but all such observations have entirely failed to take account of muscular movement of feeble intensity. In order to study these muscular vibrations, M. d'Arsonval has for several years employed a magnetically adjustable microphone, which he calls a "myophone." This instrument produces a sound long prior to a nervous excitation sufficiently powerful to create a visible muscular contraction. By means of this apparatus, M. d'Arsonval has been enabled to prove that a nerve remains alive for hours after death. This is easily demonstrated by attaching, say, the Achilles' tendon of a guinea-pig or a rabbit to the myophone and then exciting the sciatic nerve by means of a current intermitting 50 to 100 times a second. Such tests show that the nerve can and does act upon the muscle, without necessitating its visible contraction, and that a distinct muscular vibration takes place. It also proves that a nerve dies much slower than has been currently believed.

We believe that where traffic is heavy on a trolley system, such as is the case in Boston and Brooklyn, and where the number of trips per day is great, the strain on the brain and nerves of the motorman must be very intense. He must, in order to be in the good graces of his employer, make the required number of trips, keep his car on time, avoid accidents to people and vehicles, and be on the alert for persons who want to ride. The hours of labor of a motorman should be carefully adjusted so that he may at all times be able to think and act quickly in cases of emergency. A tired-out workman is generally worse than none.

LETTERS FROM A LABORATORY.—LV.

BY JULIAN A. MOSES.

Occasions may often arise where the use for a tool having an exceedingly sharp and hard cutting edge presents itself. In case steel is taken for this purpose it is difficult to maintain an edge, owing to the fact of its extreme brittleness after being plunged into ice water or even cold mercury. By hardening merely the tip of the tool and allowing softer steel to back it up a more lasting tool may be obtained.

This is readily done by using the tool as the negative pole of a strong current, and by Burton's process, which consists of immersion of the negative terminal into a soda solution contained in a bucket having a large lead plate as the positive terminal, heating about an eighth of an inch of the tool to a cherry red and plunging it immediately into cold water.

It will be seen that this is nothing more than a kind of case hardening process, possessing the additional advantage of the exact localization of the intense heat. In case the object to be thus treated cannot be conveniently brought to the bucket of water, a small stream may be projected upon the article, thereby producing a centralization of the heat which is immeasurably better that the effects produced by a blast lamp or even an oxy-hydrogen flame.

If a still harder tool is desired, the diamond must be employed; both may be used, but in the long run it will be found better to use the so-called "carbon" or black diamond.

The process for mounting these diamonds is an ingenious one, and one might think superficially that this manner of procedure would be impossible, owing to the fact that such an intense heat being applied to them might cause their immediate fracture and disintegration.

The method is as follows: The diamond is tied with iron wire in such a manner as to conveniently hold it in the moulding sand while melted wrought iron is poured upon it.

A pattern of the tool is first made and around this is moulded the slightly moistened sand. The diamond is now inserted into the sand so that irregular parts will project above and remain bare to be surrounded by the molten metal, as it is poured through a fairly large "sprue."

To avoid cracking the diamond, no water should remain in the mould, which ought to be baked for quite a while to eliminate all moisture.

When it has thoroughly cooled the tool may be removed from the sand, being careful not to cool it by immersion in cold water.

There will now result an instrument that will prove of much service. It is better to dress off the iron rod neatly, either by turning or filing and slightly tapering the end to give the cutting point of the diamond a free swing; fit a handle, and you have a tool that will turn, or rather abrade, any article requiring such manipulation.

But a small portion of the diamond should project beyond the tool, for a violent blow would be apt to shatter it if the part not enclosed in the iron be of a length exceeding about an eighth of an inch.

When the diamond edge has been dulled by considerable cutting, the resetting of the stone should be considered. This may be accomplished by holding the iron portion of the tool against a rapidly revolving emery wheel. When the surrounding iron has been completely cut away, which will be known as soon as the diamond begins to cut into the emery wheel, the diamond may be safely removed with a sharp pointed instrument, a fresh surface presented and reset as before described. It is astonishing what results can be obtained using the diamond as a cutting tool, and if a suitable edge is obtained, smooth and even polished surfaces may be produced on most materials which have hardness less than that of the black diamond.

Wall Street and the Electrical Stock Market.

The market during the period under review has been a most trying one to owners of securities. The liquidation which has been going on since early in June received a fresh impetus through London selling of our better grade of railroad stocks, which resulted in shaking out large blocks of securities held by Americans. These caused the market to decline still further, and in the early days of the week it looked as if a panic was inevitable. The condition was so bad that even the bears, who dread an actual panic almost as much as the bulls, started in to cover. This checked the decline, and at various times during the week imparted a semblance of strength to the market. The advance was in those gilt-edged active stocks, which suffered the greatest depression. While this class of securities closed the week much stronger than they opened, another class, known as the industrials, continued to decline throughout the period, closing weak and semi-panicky. This was noticeable, too, of General Electric and Sugar, and in part applies to Western Union.

The market, as viewed from a week prospective, showed some improvement. The rate on call is easier, while time loans in commercial circles are being made. The foreign exchange rate weakened materially on the rebuying by London of stocks which it sold on Saturday of last week, and of the rather free offerings of commercial bills, notably those sold against grain exports. As yet there are very few September and October cotton bills in the market. The financial situation in the West, notably at Denver, reached the acme of demoralization, and a decidedly weakening tendency upon all classes of securities.

The market at this writing is very narrow, being almost entirely deserted by legitimate buying business, and consisting of the operations of professionals, who are working for a turn. There is a considerable short interest, which, however, is not as large as it was on Monday. It is no market for an investor to deal on margins. The man with capital, who can buy stocks outright, will not make any mistake by availing himself of the extraordinary bargains which are offering.

The Street has a sore, lame feeling, while its vitality, to all appearances, is very sluggish. Even with most favorable conditions, it will require a considerable time to recover from the effect of the decline in the past two weeks.

General Electric was the active stock of the week, suffered the greatest decline, and naturally was the center of interest. On Thursday it dropped to 46½, a loss of 17½ points from the opening on Monday. On the day of greatest decline it rallied to 48¾. On Friday it touched 50½, and to-day the closing quotation was 49½. On Friday the five per cent. debenture bonds sold at 68, against an opening on Monday at 79. The comparative value of the bonds earning five per cent. and of the stock earning eight, is a subject of interest. The bond being a debenture, could hardly be classed as a first lien on the property. Nevertheless, it is regarded as more secure than the stock, as is evidenced by the price. The difference exemplifies the point which we have made repeatedly in this column, to the effect that in times like the present an active security will invariably suffer the greatest decline. This is worthy of consideration by capitalists who desire investments "for investment purposes only."

There were a thousand and one rumors afloat in the Street to account for the savage decline in the stock, coupled with many of them being hints of a receivership. Wall Street almost invariably looks to the tape for an indication of the condition of the property, and was inclined to regard with more or less skepticism the many assurances made by officers of the company that its affairs were in good shape. These assurances, not being backed up by substantial support for the stock, have given rise to several hypotheses, one of the most prominent of which is that there are internal dissensions in the management which are largely responsible for the decline. The story is that the Thomson-Houston faction, which had made a specialty of manufacturing, has taken exception to the construction department, which was largely a feature of the old Edison General Electric Company, on the ground that the latter is losing money. It is said that as a result operations in the constructing department have been materially curtailed.

A capitalist in a position to know all about the affairs of the company says that it has suffered very much from bad times. The result has been a wholesale discharge of its employés. May business was good, but the falling off in June and so far in July is said to have been enormous. This has been true of almost any manufacturing business, but General Electric, owing to the nature of the holdings of its stock, has proved an easy mark for bears, who forced liquidation with comparatively easy effort.

We are informed by a broker who handles the company's paper, and who has unusual opportunity for ascertaining the position of the company's finances and business, that he is convinced that the decline in the stock has been brought about in this way. Certain Boston interests were not personally agreeable to other interests in the company. Stocks held by these Boston people was known to be vulnerable; it was gunned for, and obtained. The campaign is perhaps not quite over, but practically the object sought for had been gained.

The president of a National Bank says: "I know that an examination of General Electric's affairs has been made and that it shows that its finances are all right."

It is but fair to give in this connection an official view. The following, published by one of the news agencies, are the remarks of a director of the company: "The drop in the stock is due more to the necessities of the holders and to their fears as to the general outlook than to any condition of the company itself. I have looked into the matter carefully and am satisfied that there is nothing the matter with the company's financial condition. Its finances are in good shape. Its business is good. As to the future, it must, of course, take its chances with every other manufacturing business. The times are such that capital is in no hurry to embark in new enterprises. Street car companies which have managed so long to use horses for power will hardly undertake to change to electric cars at present. All these things work against the company's future. If it is the future that people are selling the stock on, I can understand it; but then it is no worse off than other properties. If it is on the present, I cannot understand why it should be sold more than any other stock."

Western Union suffered further declines on liquidation along the lines prophesied by us last week and the week before. The lowest point reached was 75¾ on Friday, against an opening Monday of 78⅛. There is a considerable short interest in the stock. We understand upon good authority that the Baltimore and Ohio, which has been hard up for ready cash for some time, has been selling its holdings of Western Union. This, in a measure, accounts for the decline.

A director of Western Union says that there has been no marked falling off in gross earnings so far this quarter, and as to net earnings, that he anticipates an increase over last year, as there is a great deal less money being spent for construction.

There were quite a number of transactions in the 5 per cent. bonds of Edison Electric Illuminating, on a decline, which gives rise to the belief that they were liquidation. The stock received one sale at 99.

In the less active stocks Northern American lost 2 points to 6; American District Telegraph sold at 48; and American Telegraph and Cable at 78 and 77½.

On the Boston Exchange, American Bell Telephone lost 5 points to 175; New England Telephone was bid 55; Fort Wayne Electric received no inquiry, while Westinghouse was bid 20. The sales of General Electric aggregated 9,500 shares, the lowest point being reached at 47.

New York, July 22.

Good Contracts for Hard Times.

The Hughes & Rigby Engineering Company, of Baltimore, have closed the following contracts:

Frederick and Middletown Valley Passenger Railway, nine miles, complete, including track laying and grading. Six cars and equipment, 150 horse power. Steam plant and 100 kilowatts generator. The generator is to be of Siemens & Halske make, for which company the Hughes & Rigby Manufacturing Company are agents for the South. Messrs. Royce and Marean, of Washington, D. C., are also interested in the Frederick contract.

Havre-de-Grace, Md. Franchises and street lighting contract for five years. They will install about 3,000 lights, running lines to Aberdeen, Perryville, and consumers adjacent.

The above named engineering company have just started a 1,000 light plant at Lambertville, N. J., and report business in a general way booming, notwithstanding the cry of dull times.

In another place in this issue our European correspondent gives a brief account of the battle being waged between the electric railway and telephone interests in England. The electric railway interests are very young yet in England, while the telephone companies are old and well established. The fight is being made early and promises to be interesting.

An Electro-Therapeutic Course.

A strong tide of progress in electro-therapeutics has set in during the last two years in this country, and many medical men of acknowledged standing have become so convinced of the importance of electricity in the medicine of the future, that they have undertaken a course of special study in the subject, and so been enabled to place themselves abreast of the newest and most approved practice. Many practitioners, however, are unable to avail themselves of the regular post-graduate college course, and will gladly welcome such an opportunity for tuition as is afforded by the private clinic of Dr. Robert Newman, in this city. After many solicitations from practitioners to give private lectures in electro-therapeutics, and particularly in surgical electrolysis, Dr. Newman decided to give such a course. The instruction is given in the same manner as that in post-graduate colleges, except that it is private, and limited strictly to a small number of students. The course consists of twelve lectures, in which clinical instruction is predominant, the *modus operandi* of all operations being shown. The past course has been eminently successful, and the class for the next course, which will begin on November 1, is already made up. Dr. Newman has been called "the father of medical electrolysis," and his labors in this field for the last quarter of a century have been abundantly recognized. He has designed many of the most effective electrodes now in use, and has contributed in a marked degree to the placing of electrolytic practice in medicine on its modern basis. Dr. Newman has been invited to deliver clinical lectures in electrolysis in Chicago, by the Post-Graduate Medical School, during the course which begins September 1.

PERSONAL.

Mr. Chas. A. Schieren, the well known leather and belt merchant, is talked of as the next Republican candidate for mayor of Brooklyn, in which city he resides. Mr. Schieren would be a splendid man for the office.

Mr. F. H. Prentiss, president of the Buckeye Electric Company, of Cleveland, O., was a New York visitor last week, looking after the business of the Buckeye incandescent lamp, which has rapidly increased throughout the East.

Mr. J. H. Rhotehamel, of the Columbia Lamp Company, St. Louis, was a New York visitor last week, and received many congratulations from his Eastern friends over the strong and so far successful fight he has made against the incandescent lamp monopoly.

OBITUARY.

Mr. John W. Beane, at one time secretary of the National Electric Light Association, and widely known in the electrical field, through his connection with the Mather and other electric companies, died at Portsmouth, N. H., Monday, July 17. Mr. Beane was a gentleman of fine technical ability and engineering skill, and would undoubtedly have made a great record in the progressive electrical field had he not of late years become a great sufferer from rheumatism, which almost entirely unfitted him for work. Scores of friends among the early workers in the electrical field will sincerely regret to learn of his decease. Mr. Beane leaves a wife and one daughter, who reside at Portsmouth.

Fire in a New York Telephone Exchange.

The Eighteenth Street Exchange of the Metropolitan Telephone and Telegraph Company, at Broadway and Eighteenth street, was thrown out of service for a little while on July 20 by a fire which occurred in the lower part of the building in which it is located. The switchboard was not damaged, but the external connections were burned off. This exchange accommodates about 2,000 subscribers located in the district bounded by the East River, Fourteenth street, the North River and Twenty eighth street. Service was resumed the following day.

Important Storage Battery Decision.

An important storage battery decision was rendered on July 18 by Judge Coxe, in the U. S. Circuit Court for the Southern District of New York, in the case of the Electrical Accumulator Company *vs.* the Julien Electric Company, declaring the famous Fauré patent to have lapsed and expired, by reason of the prior expiry of the Fauré Spanish patent for the same invention.

President Wm. Bracken, of the Consolidated Electric Storage Company, New York, in speaking of this decision, says:

This decision is the outcome of the long and protracted litigation between the parties now representing the Consolidated Electric Storage Company, on the one hand, and the parties representing the Accumulator Company, successors of the Electrical Accumulator Company, on the other hand. The contest has been maintained with unabated vigor for nearly seven years. At first, the victory seemed to be on the side of the Electrical Accumulator Company, who obtained an injunction against the defendants on April 12, 1889, compelling the stoppage of the electric cars on Fourth avenue. Then the defendants got control of the Brush storage battery patents, and joining in the Brush suit vigorously attacked the complainants, defeating them; but the complainants maintained that it was but half a victory, for the reason that without the aid of the Fauré process—"paint, paste and cement"—the defendants could not make a practical storage battery, although possessed of the Brush storage battery patents—the fundamental patents; in other words, the complainants contended that the active matter or layer must, to be successful, be applied in the form of a paste and not in the form of a powder, as practiced by the defendants.

Late in 1890, the defendants became aware that the Fauré Spanish patent would expire the following year. Steps were immediately taken to secure the proper documents from Madrid. The formalities to be observed in doing this were numerous and difficult to follow. However, after many disbearting set-backs and untold obstacles, the defendants succeeded in getting a complete record of the papers at Madrid, and had a rehearing in the case with the result that the patent was declared to have expired.

The situation now is, that although "paint, paste and cement," as such, is no longer patented, yet it is not open to public use; for the reason that its application to the plate or support is covered by the fundamental Brush patents, of which the Consolidated Electric Storage Company is the exclusive licensee. As a matter of fact, the process is now owned by the Consolidated Electric Storage Company instead of by the Accumulator Company, as fully as if the Fauré patent were still alive and owned by the Consolidated Electric Storage Company, as if there had been a transfer from the Accumulator Company to the Consolidated Electric Storage Company. Thus, by operation of law, the Fauré process, hitherto owned by the Accumulator Company, has become the property of the Consolidated Electric Storage Company.

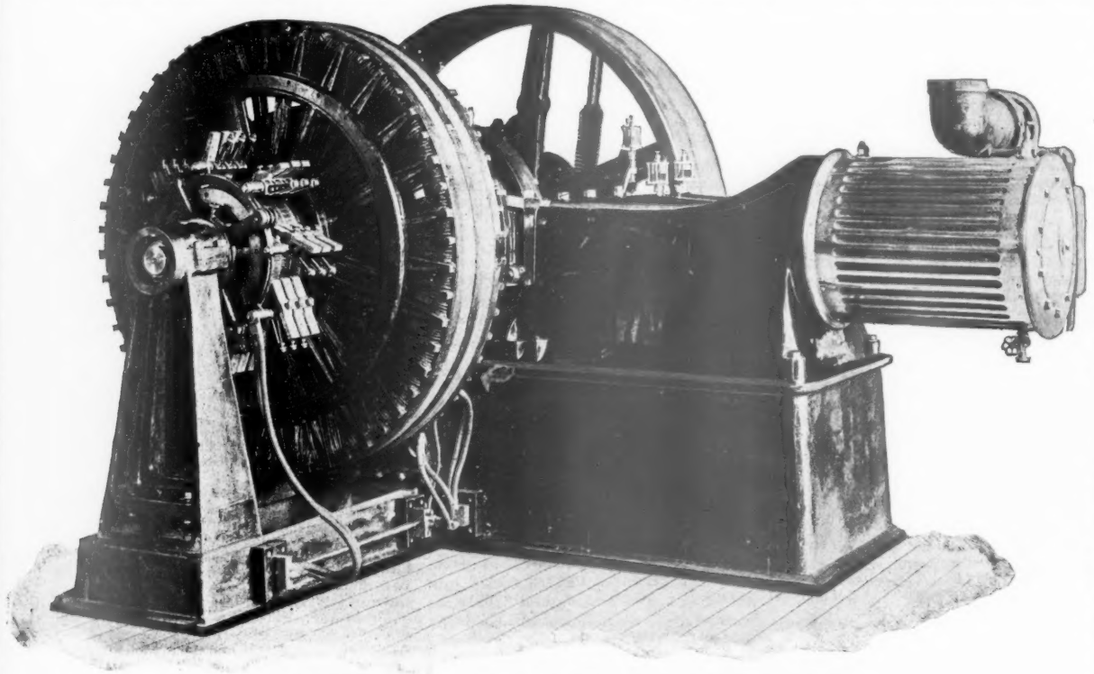
The first storage battery suit in the long line of litigation between the Electrical Accumulator Company and the Julien Electric Company, and its successors, was brought by the Electrical Accumulator Company against the Julien Electric Company on the Fauré patent, No. 252,002, being the patent declared expired in this decision. In that suit Judge Coxe sustained the Fauré patent, No. 252,002; but limited it by a disclaimer, in which Fauré was awarded merely the application of the active matter to a conducting support in the form of a "paint, paste or cement." At this time Mr. Brush's patents had not been passed upon by the courts, although Judge Coxe in that decision intimated that although Fauré was *de facto* the first inventor, yet Brush was *de jure* the first inventor. Then came on the Brush suit against the Electrical Accumulator Company, which culminated in Brush being awarded the broad claim of the *mechanical application* of the active matter to the support plate *in any form*. That is, no matter what the form of the oxide may be, whether paste or powder, only Brush, or his licensees have the right to apply it to the support. In other words, Brush was awarded the invention of applying active matter mechanically, as distinguished from Planté's method of producing the active matter by disintegration. This left the Fauré patent in the position of being an invention for making the oxide into a paste, but without the right to apply it to the support, unless licensed by the Brush Company. The licensees of the Brush Company, the Consolidated Electric Storage Company, therefore, applied the active matter in the form of a powder; but the Accumulator Company contended that a successful battery could not be made by applying it except as a paste. The expiry of the Fauré patent, therefore, allows the Consolidated Electric Storage Company, licensees of the Brush Company, to apply the active matter in the form of a paste if they so desire.

The Ball & Wood Direct Connected Engine.

The advantage of dispensing with pulleys and belts, and making the engine and dynamo one machine, has recently led to considerable development in this direction, and among the leaders in this movement has been the Ball & Wood Company, of New York and Chicago, the well-known engine builders.

The high armature speed of the dynamo has long been one of its drawbacks, but in the multipolar type of dynamo, the electrical engineer has made as notable an advance as that seen in the evolution of the high speed engine. By presenting a greater number of poles to the armature, the same rate of change in cutting the lines of force is secured with a much lower number of armature revolutions. The dynamo builder has thus wisely come down in rate of speed, while the engine builder has come up, and they have met on ground where they can be extremely useful to each other, and the new combination bids fair to be popular.

The accompanying illustration shows a Ball & Wood engine of 100 horse-power, carrying on an extended shaft an armature,



Direct-Connected Ball & Wood Engine and Waddell-Entz Dynamo.

and supported at its outer end by an independent bearing; the bearing is bolted to a base plate, common to the engine also, and if desired can be adjustable. Changes are made in the patterns of the engine frame to provide for carrying the fields, and thus a compact and complete whole is formed. In actual work, it is found that there is no loss in efficiency in either dynamo or engine, and that in regulation, the same excellent results are obtained which give this engine such prominence. The dynamo illustrated was built by the Waddell-Entz Electric Company, of Bridgeport, Conn.

The Ball & Wood Company have built and installed a number of engines connected to the leading makes of dynamos, and have just completed three engines of this character for the new Metropolitan Club of New York.

The recent breaks in the machinery of the local electric light station, at Salem, Mass., which supplies the street railroad with power, has so inconvenienced the latter, that the management of the road has purchased an 80 horse-power generator, in addition to those now owned, and placed it in the power house on Derby wharf. Whenever another break occurs the road will be enabled to run its full complement of cars without sending to Revere or Chelsea for horses, and to Lynn for cars.

ELECTRIC RAILWAY AND POWER NOTES.

The work of installing the trolley on the lines of the Philadelphia Traction Company, covering 100 miles of streets, has begun.

It is now settled that work will not be commenced on the electric car line between Findlay, O , and Fostoria until the money market opens up.

Work was begun recently on the excavation for the General Electric Company's power house on York street, at Forest City, Ont. A large number of men are employed.

Morgan County, Ind., commissioners have ordered an election in Washington township to vote on buying $48,000 worth of stock in the Indianapolis and Martinsville Electric Railway.

Eighty-five applications for conductors and motormen have been received by the street railroad management of Clinton, Mass., but not over eight men will be needed for the service. Evidently there are a few people who are not much afraid of the trolley.

A lease has been executed at Niagara Falls, N. Y., by which the Pittsburgh Reduction Company, of Pittsburgh, Pa., takes 6,500 electric horse-power from the Niagara Falls Company. The conditions of this lease provide that the Pittsburgh Company will take the first third of this electrical horse-power upon the earliest day possible that the Niagara Falls Power Company can furnish the same.

A petition has been received by the selectmen of Stoneham, Mass., from a majority of the board of directors of the Mystic Valley Street Railway Company, asking for a franchise to build and maintain an electric railway from Stoneham to Winchester, and eventually to extend the road to Arlington. All the stock of the proposed railway has been subscribed for, and is held by prominent residents of the three towns through which the road will operate.

The Woodbridge & Turner Engineering Company, the J. G. Brill Company, the Edison Electric Light Company and Pepper & Register have filed a bill against the Washington and Arlington Railway Company for a sale, a receiver and the administration of certain trusts. The bill charges that the road is managed extravagantly, and that it is in danger of losing its charter. These creditors are a majority of the bondholders. Bonds were put out to the extent of $81,000 from an authorized issue of $500,000. Mr. W. V. R. Berry, of Washington, D. C., has already been appointed receiver by the Virginia court for that jurisdiction.

TELEPHONE CHAT.

During a severe electrical storm at Wilmington, Del., last week, lightning struck the telephone exchange, set fire to the building and burned in two or three hundred wires, throwing the whole system out of service. The damage to the building was slight.

A meeting of the gentlemen who hold telephone franchises, recently granted in Saginaw, Bay City, Flint, Grand Rapids, Jackson, Port Huron, Detroit and other cities, will be held in Flint, Mich., in a few days to arrange for a State exchange as soon as the local companies are organized. At that time a plan of proceeding with the work throughout the State will be mapped out.

Among other projects of the British post office officials is one to establish at Leeds, in the very center of England, a telephone exchange, with which every large town in the United Kingdom will be connected, so that it will be possible for any town to speak with any other. It is intended that the work in the towns themselves shall be done principally by the telephone companies, but the post office itself will open exchanges where there are no companies.

The new telephone company of Bay City, Mich., announces that it will have its lines fully equipped and in running order inside of 11 months. A large number of orders have already been received, and the company is assured a paying patronage. Franchises have been granted it by Bay City, West Bay City and several northern towns. The organization has a strong backing and will spare no expense to furnish the best of service. The renting price of its 'phones will be $18 a year for residences and $24 for business houses.

A special meeting of the directors of the Hudson River Telephone Company, of Albany, N. Y., was held last week to consider a proposition to consolidate with the Union Telephone Company, of Saratoga County. The directors of the Hudson River Company already own 51 per cent., so that there was no trouble in adopting the proposition. The 49 remaining shares of the Union Company stock became the property of the Hudson River Company, the shareholders of the former receiving share for share of the latter stock in return. This will be a most advantageous acquisition for the Hudson River Company. The regular quarterly dividend of three-fourths per cent. was declared and ordered paid.

Announcement of the Judges of the Electrical Exhibits at the World's Fair.

Many have been the names submitted for judges of the electrical exhibits at the World's Fair, and after a long delay, due to careful elimination of those who might have any connection with the exhibitors or their interests, either financial or otherwise, the following gentlemen have been requested to act as judges:

H. S. Carhart, professor of electricity at the University of Michigan, Ann Arbor.

Harris J. Ryan, professor of electrical engineering at Cornell University.

B. F. Thomas, director of the physical laboratory, Ohio State University, of Columbus, O.

George F. Barker, professor of physics at University of Pennsylvania, Philadelphia, Pa.

T. C. Mendenhall, superintendent of the United States Coast Survey, Washington, D. C.

Robert E. Owen, professor of electrical engineering at University of Nebraska, Lincoln, Neb.

Michael O'Dea, professor of electrical engineering at Notre Dame University, Notre Dame, Ind.

W. M. Stein, professor of electrical engineering, Armour Institute, Chicago, Ill.

Samuel Reber, lieutenant U.S.A. at Johns Hopkins University, Baltimore, Md.

H. A. Rowland, professor of physics, Johns Hopkins University, Baltimore, Md.

E. P. Warner, who is chief electrician of the Western Electric Company, of Chicago, has also been selected, but it is doubtful, owing to his relation to the Western Electric Company, who have one of the most prominent exhibits in the Electricity Building, whether he can be retained as a judge. This has not been decided upon as yet, but as regards the foreign jurors, England, Germany and Belgium have appointed their representatives, and it is expected that the other countries having exhibits will soon follow suit.

Electroplating as a Fine Art.

For many years past electroplaters have sought to evolve an effective process of electro-deposition on a non-metallic base. This endeavor was at length attended with partial success, but the process was accompanied by so much danger, in consequence of the highly combustible nature of some of the agents employed, that manufacturers did not care to run the risk of setting their premises on fire. A modification of the processes has been discovered by which this danger is avoided, and the invention is now pronounced to be one of the most important that has been introduced in the electroplate trade for many years. The object to be dealt with, whether it be a sprig of natural holly or ivy, a bit of common hedge briar, a fern, geranium leaf, Marguerite daisy, a terra cotta group is submitted to the process, which is the inventor's secret. It next receives a deposit of copper, which renders it perfectly ductile and practically indestructible, and it is then ready to be either silvered or gilt by the ordinary process of electroplating. This invention comes from England, where it is being largely employed in ornamental work of various kinds. Some of the effects produced by it are said to be exquisitely beautiful. For instance, cracker, glove and trinket boxes, and drinking cups are twined around with sprays of ivy or holly, the veining of the leaves and the sharpness of the prickly edges of the holly being as perfect as they were in their natural state. To other articles lace is added in a similar manner, and while all the delicate gossamer appearance of the lace is preserved, its character is so changed that it has become metallic, and may be removed whenever the article which it embellishes requires cleaning. In the same way the ornamentation is applied to the backs of hair brushes, and an infinite variety of other articles, the materials used being natural leaves and flowers. Terra cotta ware can be treated by the same process, and when bronzed makes attractive ornaments, which cannot readily be broken. —*Pittsburgh Dispatch.*

The Thompson Smokeless Fire.

The problem of smoke consumption, with its attendant saving of fuel, has no doubt at one time or another occupied the attention of every central station manager. But the idea of having a fire without smoke is a problem which every one will study with interest. These fires have been in use in Great Britain and other foreign countries for some time past. They are the result of 25 years' experience and tests by Mr. J. Knapton Thompson, a well known engineer of Leeds, England. An American Company has been formed to introduce this system

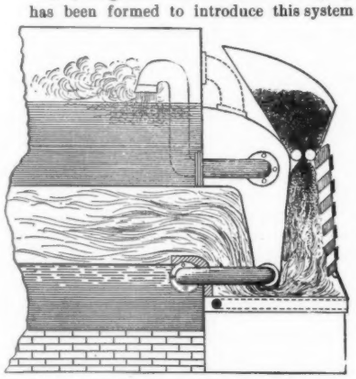


FIG. 1.—THOMPSON SMOKELESS FIRE.—FRONT FIRE-BOX WITH AUTOMATIC FEED.

here. It is called the Thompson Smokeless Fire Company, and its offices are at 803 and 804 Hamilton Building, Pittsburgh, Pa. The officers are J. Knapton Thompson, C. E., F. S. Sc., chief superintendent and consulting engineer, and C. F. Jahn, general manager. The first furnaces in this country for steam boilers and domestic uses are now in operation at Pittsburgh, where, it is said, they have been eminently successful.

Our illustrations show applications of the Thompson system, which is, in brief, described as follows:

In ordinary type boilers the overheating of plates is largely caused by the manner in which the steam is released from the water. It is well known that after the plates or tubes have become hot, they impart their heat to the water above them until small bubbles of steam are formed. These bubbles increase in size until their lighter specific gravity detaches them from the plates or tubes, and they rise upward and pass through the water into the steam space. In their passage upward they leave behind whatever solid matter they contain, and they, at the same time, are impregnated with moisture.

All the water in a boiler over the Thompson smokeless fire must pass through the lower pipe into the inverted bridge at the back of the fire-box, and thence through the upper pipes into the crown of the boiler. This enables the heat to be taken up more rapidly by the water, and the constant scouring action of the continuous currents of water through the bridge and boiler prevents the deposit of scale, and will often clear off old scale.

The constant impact of fresh particles of water on the plates of the bridge carries away the heat instantaneously, and there is no possibility of the water being still or dead in any part of the boiler. Besides this it will be seen that on reaching the crown of the bridge, the steam is liberated without having to pass through the water, and there remains practically dry steam in the steam space.

The more promptly the heat of combustion can be taken up by the water, the more efficient is the evaporative performance of the boiler; and bearing in mind that heat is more rapidly transmitted where strong circulation exists, it will readily be seen that the Thompson system of smokeless fires is most eminently adapted for this work, thereby creating several important economies.

The arrangement or apparatus herein referred to is exceedingly simple and inexpensive, and not like most of the so-called "smoke consumers." Neither does it allow any light colored or brown smoke to escape for so many minutes during the hour; but it works as naturally as any ordinary fire when consuming fuel in the ordinary way, and, it is claimed, positively prevents the formation of smoke.

In order to obtain perfect combustion of fuel, an entire absence of smoke, and the maximum economy in fuel, it is absolutely necessary that the fire-box shall be so constructed that hydro-carbon and other gases evolved from the fuel may obtain the necessary and equivalent volume of oxygen from the atmospheric draught to enable them to thoroughly and intimately mix and unite prior to the mixture being exposed to the requisite temperature for ignition. Unless this be done, only a portion of the gases ignite, the remainder passing off in the form of smoke and invisible carbonic oxide as positive waste.

In this system the fire-box is so arranged that the fuel is continuously distributed in a finely regulated rain like feed, and the air supply so adjusted that the gases arising from every ounce of coal are provided with an equivalent volume of air, and special facilities which positively insure the thorough mixing and uniting of the oxygen and other gases *prior* to reaching that temperature when they all ignite, and thus result in the most perfect combustion of fuel—there being nothing but pure flame passing into and through the flues, which, after doing service, escapes in the form of carbonic acid gas.

The caloric value of the fuel is still further

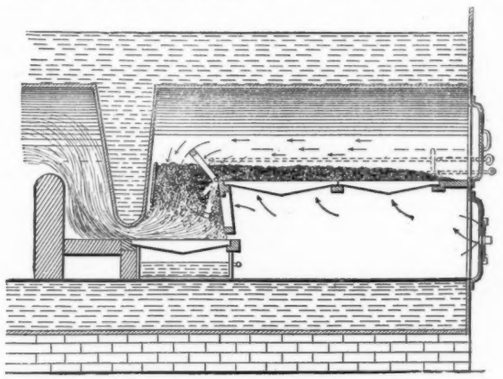


FIG. 2.—THOMPSON SMOKELESS FIRE.—REAR FIRE-BOX, HAND FEED.

increased in its intensity by a simple arrangement, whereby a larger percentage of hydrogen is obtained and introduced into the body of the fuel where it at once unites with the other gases and thereby facilitates most complete and perfect combustion, and, it is claimed, without creating a particle of smoke or an atom of soot.

The Pennsylvania Railroad Adopts the Long Distance Telephone.

A long distance telephone system, connecting the offices of the leading officers of the road, will be installed by the Pennsylvania Railroad. The important points on the Pennsylvania system thus brought into close call of each other with Philadelphia are New York, Jersey City, Wilmington, Baltimore, Washington, Harrisburg, Altoona and Chicago.

The wires in these and other cities on the Pennsylvania system where important executive offices are stationed, will run into the private offices of the higher officials, and a vast saving of time, as well as other advantages, will be the result.

The introduction of this system, which has been under consideration for some time by the Pennsylvania officials, is largely due to Charles E. Pugh, third vice-president, who has given a great deal of personal attention to the project, and in whose hands the working out of the system was largely placed. Mr. Pugh developed the plans, decided upon the points to be reached, and made the final contracts with the telephone companies.

The system is intended for the exclusive use of the high officials in the transaction of the company's business, and will be extended. No one will be allowed to use the telephones except these officers, even though they desire to communicate with an official.

It is, of course, understood that the Pennsylvania railroad telegraph will be maintained at its present high standard and improved whenever there is a possibility for doing so.

Smoke Prevention.

At the meeting of the Engineering Association of the South, Nashville, Tenn., July 13, the subject of "Smoke Prevention" was presented by Prof. Olin H. Landreth, of Vanderbilt University. The paper discussed successively the causes, the effects of smoke and the remedies for it. Objectionable smoke comes mostly from bituminous coal, other fuels producing very little smoke. When fresh coal is thrown on incandescent coal, there at once begins the distillation of the more volatile hydro-carbons, which distilled matter is burned if sufficient oxygen is present and the temperature is sufficiently high, but which otherwise passes up the chimney as yellowish fumes. As the fresh coal becomes more highly heated, the less volatile hydro-carbons are distilled, and are decomposed at a temperature much below that necessary for the combustion of the carbon liberated—about 2,000 degrees F.—a temperature so high as to give considerable margin of opportunity for this portion of the carbon to escape unburned. It is this free, unburned carbon in a finely divided state that, while incandescent, produces the luminous flame and, when cooled, the clouds of smoke that issue from the chimney and afterwards settle as soot. After the volatile matter is driven off the fixed carbon remains, and in burning produces but little flame and no smoke, since the particles of carbon are not detached from the solid mass till combustion takes place. As to the effects of smoke production, the fuel loss in the smoke itself is but small, estimated at one-sixth of one per cent.; but the causes of smoke are also the causes of imperfect combustion and consequent waste of fuel in the form of invisible gases, carbonic oxide and light hydro-carbons, and the presence of smoke indicates this parallel waste. Aside from the fuel waste, the effects of smoke outside the furnace make its abatement of public interest. It is authoritatively stated that the residuum of smoke in the lungs induces consumption of an incurable character, and that, in the city of Pittsburgh, Pa., the death rate was 1.62 per 1,000 lower during the eight years in which the use of natural gas has almost freed the city from smoke, as compared with the preceding eight years; and that, since the partial return of smoke, the rate has increased 2.57 per 1,000. Carbon in a finely divided state is an easy vehicle both for noxious gases and organic impurities. The insidious soot pervades and defaces public and private buildings, and calls for fruitless efforts for cleanliness, when cleanliness is impossible. Smoke is objectionable from the loss of light and increased cost of artificial light; also from the repression of æsthetic tendencies and consequent mental and moral discouragement. Consideration of the causes suggests the agencies and the mechanical devices for the prevention of smoke; these latter, so far as pertains to steam boilers, are classed as mechanical stokers, air flues in the walls and grate-bars, coking arches, dead plates, down-draft furnaces, steam jets for injecting air and mixing the gases, baffle plates and double furnaces. Smoke prevention must be accomplished by educating the public to consider smoke a nuisance that unquestionably can and should be abated, for the smoke producers are very slow to be convinced that this abatement is to their interest. Following the influence of public sentiment, laws are to be enacted and provision made for their enforcement, and for furnishing to smoke producers, when desired, professional advice regarding the means and appliances for smoke prevention. The paper gives the statutes passed in Chicago, Cincinnati, Cleveland, Pittsburgh, New York, Rochester, Boston, Denver, the State of Ohio, and the city of Birmingham, England, with statements of the success attained in preventing smoke in these localities, success in each case being proportional to the vigor of action taken; it also contains descriptions of various mechanical devices for smoke consumption, and closes with a list of literature on the subject.

Queen & Company at the World's Fair.

Queen & Company, incorporated, of Philadelphia, have recently issued a circular letter in regard to their extensive electrical exhibit at the World's Fair. As it contains information of interest to our readers a copy is appended:

DEAR SIR: While your visit to the World's Fair may be largely for enjoyment, business interests will doubtless claim a certain amount of time, so that we take pleasure in inviting a careful study of our collection of standard electrical instruments as exhibited in the Electricity Building, Section E, ground floor, north end. For months past we have been preparing for the Exposition, with the result that many of the pieces shown are quite new in design and can hardly fail to prove extremely interesting. Among them are the Ryan electrometer, modified Mascart electrometer, contact maker, horizontal magnet, d'Arsonval galvanometer, Queen-Thomson galvanometer, Queen-Siemens galvanometer, standard ballistic galvanometer, Anthony tangent galvanometer, portable d'Arsonval galvanometer, compensated shunt box, standard resistance box (Anthony form), standard P. O. box, 100,000 ohms box, oil immersion standard coils, standard meter bridge, standard cylindrical bridge, Carey-Foster commutator and bridge, conductivity bridge, complete cable testing set, "Acme" portable testing set, "Decade" portable testing set, standard condenser, new design, adjustable carbon rheostat, aluminum-iodine testing battery, electric light photometer, Cardew voltmeters, electro-dynamometers, station ammeters and voltmeters, Kelvin standard balances, electrostatic voltmeters, pair of Hertz mirrors, arc light projector, etc., etc.

The photometer and projection lantern can be seen in practical operation in our dark room, and when possible every facility is afforded for a thorough working examination of all the apparatus we show.

Some of the instruments are finished more highly than usual, but are offered for sale at regular net prices, except where actual increase results in efficiency as well as appearance.

Intending purchasers will kindly remember this fact and avail themselves of a rare chance to secure exceptionally high grade apparatus at what is really but slight advance over cost of labor.

The Armour Institute, of Chicago, has already reserved a number of these pieces to be delivered when the Fair has closed, and we anticipate an early disposal of the remaining important instruments.

The cordial welcome assured by our experts in

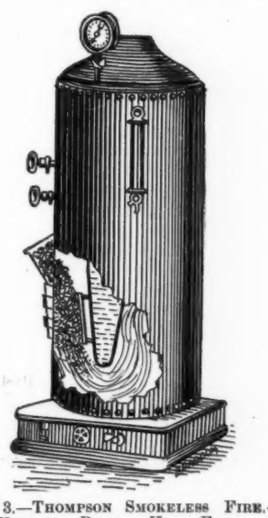


FIG. 3.—THOMPSON SMOKELESS FIRE.—VERTICAL BOILER, HAND FEED.

attendance does not depend, however, upon immediate orders, and we are always glad to receive calls from scientific friends who may be interested in our work, whether or not any business results.

The sessions of the American Association for the Advancement of Science and of the International Electrical Congress, to be held in August, will be largely attended, and we have arranged to be properly represented at both. We desire that at these times our various exhibits shall be utilized for resting places, meeting friends and in other ways as may best suit the inclination or convenience of visitors.

Kindly note that in addition to the above we have five exhibits in the Liberal Arts Building, as per card enclosed, to which we also ask your kind attention.

Hoping very much to have a call from you this summer at Chicago or Philadelphia, or both, we are, very respectfully,

QUEEN & COMPANY, Incorporated,
Electrical Department.

Electric Traction versus Telephony in England.

FROM OUR EUROPEAN CORRESPONDENT.

In a recent issue of the ELECTRICAL REVIEW reference was made to the appointment of a Joint Parliamentary Committee of the House of Commons and the House of Lords to inquire into the working of electric tramways, and to determine whether the partial use of the earth as return should be prohibited or restricted, so as to prevent interference, either by leakage or induction, in any other electric circuits, as, for instance, telephone, telegraph and railway wires. That Joint Committee, presided over by Viscount Cross, has sat for nearly a fortnight to receive evidence from the various interests concerned. Having been present at the various sittings of the committee, it may be interesting to briefly summarize the most important points raised.

The subject dealt with is of the greatest importance to all electrical interests in the whole world, and it is doubtful whether there has ever been on any previous occasion such a mass of evidence of vital importance brought forward. The various interests concerned are: The National Telephone Company, the railway companies, the gas and water companies, the electric traction companies, and various municipal corporations throughout England and Scotland. It is noteworthy that the gas and water companies would not have been represented before the committee had it not been for the fact of Mr. W. H. Preece having referred to the danger of electrolytic action on gas and water pipes on the occasion of the first meeting of the committee. It will scarcely be necessary to mention that scientific witnesses gave evidence for each party.

TELEPHONY.

The National Telephone Company, with the exception of a small percentage carried on by the post office department, has a monopoly of the telephone business in the United Kingdom. The company has over 90,000 miles of wires, and the number of messages or conversations sent over its wires per annum exceeds 200,000,000. A very small portion of the wires is arranged on a complete metallic circuit system, but the whole of the remainder has either an actual earth return, or a return formed by connecting the wires to the gas and water pipes in the houses, and consequently to the main pipes in the streets and the earth. About £4,000,000 has been expended on the telephone service of the country, and witnesses were called who stated that a further expenditure of £2,000,000 would be necessary if the company was compelled to duplicate its wires, or, in other words, lay down a complete metallic return. It was urged that the duplication of its wires would necessitate a re-arrangement of the whole system, that new switchboards would be required, and that during the process of changing from the single-wire system to the twin-wire system, the whole telephone service would be brought to a stand still. The proper working of the telephones has been interfered with by the operation of the electric tramways at Leeds and at Walsall, where both the tramways are equipped on the single overhead trolley system, with the rails forming the return. Why, asked the telephone company, should our wires be disturbed by leakage or induction when the tramways by adopting an insulated metallic return, can prevent any interference? Why should we be put to enormous expense when the tramways, at little cost, can stop the disturbance? We and the telegraphs were first to use the earth, and why should we be dispossessed of it by electric tramways? The telephone company submitted further that the overhead single trolley system was unnecessary; the double trolley system as used at Cincinnati, United States, could be adopted if overhead wires had to be employed; if not, there was the open conduit system as successfully worked at Buda Pesth. The telephone company urged that Parliament had acted rightly in inserting, in 50 provisional orders or bills giving powers to work tramways electrically, clauses protecting the telephones and preventing the tramways from disturbing them. The telephone company asked for a continuation of such protection.

RAILWAY TELEGRAPHS AND TELEPHONES.

On behalf of the railways, witnesses gave evidence of the disturbances set up in the signal and other wires of the Midland and London and Northwestern railways at Walsall through the working of the electric tramway in that town. Those witnesses, however, admitted, in cross-examination, that the interference had ceased immediately on the railway signal wires being duplicated at small expense. It was submitted that if the electric tramways were permitted to use the earth as return, considerable danger would result to the traveling public; this was instanced by the statement that signals had, through leakage or induction in the wires, been lowered from the position of "danger" to that of "line clear." It was urged that the success of the single trolley system in the United States only showed that it was cheap enough to prevent better systems being adopted in this country. The railways did not want the overhead tramway wires; there was the accumulator system, the open conduit system, as at Buda Pesth, or a closed conduit system—one of those could be used. The railway companies desired that electric tramways should be so constructed and worked as to prevent any injurious effects by leakage or induction in the railway signal and other wires.

Thus far it will be seen that what the telephone and railway companies desire is that completely insulated returns should be adopted in the case of electric tramways, and also that induction should be prevented; or, in other words, they ask for impossibilities to be done. Let us, however, now turn to another side of the question, where the matter is shown in a totally different aspect, and by those interested in the progress of electric traction.

For instance, Mr. J. Swinburne showed the difficulties incidental to insulating the return in the underground culvert system and the return in the single and double trolley systems. In fact, from a practical engineering point of view, it was impossible to absolutely insulate the return circuit so as to prevent interference with telephone and other wires; whilst at the same time induction, which was more serious than leakage, could not be prevented. An electric tramway, he said, could not be constructed so as to make it absolutely certain that it would not cause disturbances in telephone and railway signal wires. On the other hand, the telephone company, by adopting a complete metallic return and twisting its wires, could prevent any interference in its wires, either from leakage or induction, and thus overcome the difficulty entirely. Mr. Swinburne considered that the overhead single trolley system was the best, and he would advise its adoption wherever the authorities would allow it. The slot system as used at Buda Pesth would be impossible in this country on account of the complication of crossings and the size of the culvert required. Apart from electric traction, he considered that in a few years, on account of the development of electric lighting, both the telephone and railway companies would be compelled to adopt metallic returns to protect themselves.

It has been mentioned above that in 50 cases Parliament has, during the past three years, and at the request of the telephone company, inserted clauses (protecting the latter's wires) in bills or provisional orders authorizing the use of electric power on tramways, and which may be termed "protective clauses." Now, let us see what has been the result of the protective clauses. The Glasgow Corporation desired a few months ago to substitute electricity as the motive power on their tram lines, the protective clauses being contained in the Corporation's Act of Parliament. Eleven firms or companies sent in tenders for the contract, but not one would undertake the responsibilities of those clauses, which would have compelled the contractor to indemnify the telephone company in case of the wires of the latter being disturbed by the operation of the tramway. Mr. R. E. Crompton testified to this fact, and he was supported by other electric tramway contractors in this country. It was, in fact, a practical impossibility for any one to comply with the protective clauses. Mr. Crompton, moreover, said that the slot system used at Buda Pesth—and which he had personally examined—could not be introduced in this country. It would, perhaps, be possible to adopt a similar method with a slot of less width, but there again, there was the difficulty and complication experienced at the blanks—that is, at the crossings where there was no electrical connection between the car and the conductor—and where the cars had to be pushed over the cross..gs. The difficulty might be overcome by the use of two ploughs instead of one, but that introduced complication, as he had found by experience.

Mr. Alex. Siemens confirmed the remarks of previous witnesses as to the difficulty of laying down in England the slot system as used at Buda Pesth. He stated that to install it would necessitate an expenditure of half as much again as at Buda Pesth. He had tried to introduce it at Bradford, but it was impossible, and it would be impossible to lay it down in large towns.

Other witnesses having testified to the stoppage of electric traction through the insertion of the protective clauses, Mr. A. R. Bennett, the telephone expert of the United Kingdom, was called to give evidence compulsorily, "by order of the House of Lords." Mr. Bennett (who is engineer and general manager of the New Telephone Company, which has practically been absorbed by the National Telephone Company) flatly contradicted most of the statements made on behalf of the telephone company. Mr. Bennett's evidence, which, as already mentioned, he did not give voluntarily, made a good impression upon the members of the committee. He stated that the transformation from a single wire system to a complete metallic circuit system would not necessitate great expense; that it would not be necessary to change the switchboards; that an exchange designed originally for a complete metallic system would not cost appreciably more than a single wire exchange, and that he would everywhere advocate the adoption of twin wires. These statements were a great blow to the telephone cause.

Now we come to further proof of the "hindrance" caused to electric traction by the protective clauses. The engineer to the Glasgow Corporation bore his testimony as to the case mentioned above, whilst mayors and other representatives of different corporations and town councils showed very strongly how detrimental the opposition of the telephone company had been to electric traction, which they had desired to adopt.

It was finally submitted, on behalf of the electric traction interests, that the tramways should take all reasonable precautions to prevent interference with any properly insulated metallic circuit belonging to railway or telephone companies.

The last interest, that of the gas and water companies, was very weak. No proof as to electrolytic action on gas and water pipes was advanced. The danger was an anticipated danger.

Thus is closed a summary of evidence given during a fortnight. Now, what conclusions may be drawn from the evidence? In the first place, it is fair to assume that the telephone company will no longer be permitted to get enforced the monstrous protective clauses hitherto inserted; in the second, that the telephone and railways will have to adopt metallic returns for their own interests, apart from electric traction; and, in the third, that tramways will be compelled to introduce an auxiliary uninsulated conductor as an aid for the return current. This matter, of such vital importance to the electrical industries, will be referred to again when the committee has issued its report or draft legislative bill.

ELECTRIC LIGHT FLASHES.

Stoughton, Mass., has voted to purchase the electric lighting plant in that place.

The water wheel for the electric light station at Brandon, Vt., has arrived and will be put in place soon.

It is contemplated to start a new electric light company in Chelsea, Mass., for the purpose of lighting houses and stores on the incandescent system.

The contract for the erection of an electric light plant for Havre-de-Grace, Md., has been awarded Rigby & Hughes, of Baltimore, and work will begin at once.

The Edison Electric Illuminating Company, of Boston, has declared a quarterly dividend of 2 per cent., payable to stockholders of record at the close of business on July 17.

Washington, N. J., has given the contract to John Karr, of Hackettstown, for lighting the town with electric lights. The contract calls for 15 arc lights of 1,200 candle-power each, and 50 incandescent lights, of 20 candle-power each. Contract price, $1,800.

The contract under which Utica, N. Y., is lighted by electricity expires with the current year. The new contract will be made by the present council, elected and legislated into office. To give the city the benefit of competition, and enable a new company—should a competitor underbid the present contractors—to get its plant in readiness, invitation to bidders should be given at an early day, and the letting of the contract fixed for a date that will permit of getting the plant in readiness by January 1, 1894.

The committee of Norristown, Pa., which has been receiving bids for lighting the borough with arc lights, reported that beyond being delayed with price lists of boilers and dynamos, only one bid had been received, that of the Conshohocken Electric Light and Power Company, who agreed to furnish arc lights for $100 per year each, and incandescent lamps at $22 each, on a one or three years' contract; and $96 for arc and $22 for incandescent on a five years' contract. A motion to make a contract for five years was unanimously endorsed.

Electric Lighting of Omnibuses in England.

Mr. E. Freund, in a paper dealing with the electric lighting of omnibuses, described the Bristol battery, which is now used for that purpose on some omnibuses of the London General Omnibus Company. The batteries are charged during the day in a wooden structure near the Victoria railway station, the current being obtained from the mains of the Westminster Electric Supply Corporation. The only difficulties that had been encountered had been caused by the omnibus conductors short circuiting the batteries. It was estimated that with 200 omnibuses fitted with one lamp of six candle-power placed under the roof, that the annual cost of lighting would amount to 47*s.* 6*d.* per omnibus per annum.

It was mentioned that the members of the Institute had been invited to attend the opening in the Isle of Man, in October next, of the electric tramway now being built there from Douglas to Laxey, on the overhead double trolley system. This will be the first line on this method in Europe.

LITERARY.

"Proceedings of the United States Naval Institute," Vol. XIX, No. 2, have been received.

The fiction number (August) of *Scribner's Magazine* will contain complete short stories by Thomas Bailey Aldrich, H. C. Bunner, Sarah Orne Jewett, Howard Pyle, Grace Ellery Channing and W. H. Shelton. All of these stories but one are illustrated.

The *Review of Reviews* for July is strong in all its departments. In the "Progress of the World" is summed up and discussed the important political, social and economic movements of the month, and the text is enlivened with numerous portraits and other illustrations.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

New Electric Railways.

MOUNT PLEASANT, PA.—The Mount Pleasant Electric Light, Heat and Power Company will increase its capital from $5,000 to $20,000.

MORENCI, MICH.—A municipal electric lighting plant will be established in Morenci.

PHILADELPHIA, PA.—The Hestonville, Mantua and Fairmount Passenger Railway Company has decided to equip its lines with the trolley system, and will issue five per cent. mortgage bonds for the necessary expenses.

DANSVILLE, N. Y.—A franchise has been granted to the Dansville Electric Street Railway Company.

MUNCIE, IND.—The Muncie Street Railway Company has declared the deal off in which Russell B. Harrison, representing a New York syndicate, was negotiating for the purchase of the road. The company has also decided to at once supplement the steam motors with the more modern electric system of cars.

BAR MILLS, ME.—The survey has been made for the proposed electric railroad from Bar Mills to Bonney Eagle. Bids for building the roadbed and furnishing electrical equipment will be called for in a short time.

MCMINNVILLE, TENN.—The McMinnville and Smithville Electric Railroad Company has been chartered by W. G. Crowley, J. L. Calvert, B. M. Webb, T. B. Potter, J. J. Smith, and others. It is the intention of the company to construct an electric railway from Sparta to Smithville and Silver Point.

PROVINCETOWN, MASS.—Isaac N. Fellows, of Natick, Mass., representing the Thomson-Houston Company, has been granted a franchise to build an electric railway in Provincetown.

CENTRALIA, ILL.—The Centralia and Central City Railroad Company will increase its capital to $30,000, and will expend $20,000 for extensions and electrical equipment.

NEW ORLEANS, LA —The St. Charles Street Railway Company will increase its capital and equip its lines with electricity. The cost of the improvements is estimated at from $270,000 to $400,000.

DRIFTON, PA.—Charles F. King & Company have secured the contract to build an electric railway for Coxe Brothers & Company. The road will be used for hauling coal.

TECUMSEH, MICH.—S. D. Nesmith has been granted a franchise to build an electric railway through Tecumseh.

MILWAUKEE, WIS.—The Milwaukee Electric Street Railway Company; capital, $300,000. Incorporators, Charles F. Pfister, Charles Landsee and Charles Quarles.

CARBONDALE, PA.—The Crystal Lake Street Railway Company has been incorporated, with a capital of $50,000, and will build an electric railway from Carbondale to Dundaff. Promotors, C. D. Simpson, P. S. Page and J. H. Davis, of Scranton; A. S. Baker, of Carbondale.

ETNA, PA.—The Allegheny and Kiskiminetas Electric Railway Company, capital, $700,000, has been chartered to build a road, 15 miles long, from Etna to Sharpsburg. The president is T. H. Hicks, of Philadelphia, and the Directors, Ezra Lukens, A. P. White and F. A. Phillips, of Philadelphia.

LOWELL, MASS.—The Bradbury-Stone Storage Battery Company, together with a number of the auxiliary companies at Sioux Falls and Kansas City, have been merged into one large corporation, to be known as The Bradbury & Stone Electric Storage Company.

BRIDGEPORT, CONN.—The Bridgeport Railway Company, to which a charter was granted by the General Assembly, has been organized with Gen. T. L. Watson as president. The company was formed for the express purpose of consolidating in it the existing railway companies here.

Electric Light and Power.

DES MOINES, IOWA.—The Des Moines Water Power Company has transferred its electric plant to the Fort Wayne Electric Company.

OLYMPIA, WASH.—E. T. Young, of Olympia, proposes to utilize the power of Tumwater Falls to dredge Olympia's Harbor. He proposes to generate 400 horse-power electricity at the falls and transmit this to Olympia and to the dredge, by means of a copper wire, a large reel of which will be so arranged in the boat that it may be moved at will about the harbor.

HIGHTSTOWN, N. J.—The Hightstown Electric Light and Power Company; capital, $50,000. Incorporators, John Shields, of Flemington; N. W. Burdsell, of New Brunswick; and Robert N. McCarter, of Newark.

SPRINGFIELD, MASS.—A contract has been given by the Monument Mills Company, of Housatonic, for an electric plant costing about $25,000, and intended to convey 300 horse-power of electrical energy a distance of one mile. The plant will be unique from the fact that it will be the first one, commercially installed, where arc and incandescent lights and motors are all distributed from the same generator on the same circuit.

MERIDIAN, MISS. — The Edison Electric Light and Power Company has amended its charter to enable it to operate a line of electric railway.

HAVRE DE GRACE, MD.—The council has contracted with Hughes & Rigby, of Baltimore, Md., for lighting the town by electricity. A plant to have a capacity of 1,000 incandescent lamps of 16 candle-power will be erected.

HUNTER, N. Y.—The Hunter Electric Light and Power Company will build an electric plant at Tannersville.

BOSWELL, IND.—The common council contemplates putting in an electric lighting plant.

PAWTUCKET, R. I.—The joint special committee on city lighting plant has adopted the report of the committee, in which they recommend the passage of an ordinance appropriating $113,000 with which to build a municipal electric light plant.

BELAIR, IND.—John H. Rickord has submitted a proposition for lighting the town by electricity.

NILES, MICH.—A special election will be held to vote on a proposition to issue $100,000 in bonds for building a combination electric lighting and water plant.

SANTA ANA, CAL.—The citizens will vote on the issuance of bonds for an electric light plant.

Edison Company Wins the Oconto Lamp Case.

SHARP BREAK IN GENERAL ELECTRIC STOCK.

The decision in the case of the Edison General Electric Company against the Electric Manufacturing Company, of Oconto, Wis., was handed down by Judge Seaman, at Milwaukee, on July 20 in favor of the plaintiff. An injunction against the Oconto Company was granted. The defense made was an amplification of the "Goebel anticipation" on which the Columbia Incandescent Lamp Company, of St. Louis, won its victory.

A feature in Wall Street, on July 20, was the remarkable break in General Electric stock. The Oconto decision seemed to have no positive rallying effect of any magnitude on the stock. The highest price of the day for General Electric was 55¾, the lowest 46½, and the closing 48¾, showing a net drop for the day of 5¾ per cent.

Just after the news of the Oconto decision became known in New York, the General Electric Company issued the following official statement:

"An important decision was filed to-day in Milwaukee by Judge Seaman of the United States Circuit Court for the district of Wisconsin in the suit brought by the Edison General Electric Company against the Electric Manufacturing Company of Oconto, Wis., upon the now well known Edison incandescent lamp patent. The suit in which the decision was rendered was brought against the Oconto Company for infringement of the Edison patent by manufacturing and selling incandescent electric lamps, and the decision filed to-day grants an injunction against the Oconto Company, restraining it from any further manufacture or sale of such lamps. The decision of Judge Seaman is in line with the decisions of Judges Wallace, Shipman and Lacombe of the Second Circuit and of Judge Colt of the Massachusetts Circuit, and acquires especial significance and importance in view of the fact that the validity of the Edison patent was attacked by the defendant through what has become known as the alleged "Goebel anticipation." The issue of the injunction is a finding by the Court against the Goebel defense. The argument of the motion consumed an entire week in Milwaukee, and the vast interests at stake have caused the decision to be awaited with unusual interest."

In his voluminous decision Judge Seaman quotes liberally in support of his views from both the decisions rendered in the former suits of the Beacon and Columbia Companies by Judge Colt and Judge Hallett.

The Edison Electric Light Company made a motion for a preliminary injunction, which was nominally granted under the conditions laid down in the decision.

After a few explanatory remarks, mentioning the fact that the "Court has the benefit of the previous opinions and the embarrassment as well of deciding between apparent differences in views as to the measure of proof demanded," Judge Seaman says:

"The decisions and text books agree upon the general rule stated in the opinion of Judge Colt (p. 679), that an adjudication of the validity of his patent after *bona fide* contest, and especially after long and expensive litigation, entitles the complainant to a preliminary injunction, in a suit against other infringers, and that the only question open upon his motion, therefore, is that of actual infringement by the defendant of the claim so adjudged valid. Other defenses are then reserved to final hearing, and injunction issues, as of course in the same court, and by comity in other courts. One exception to this rule is sometimes allowed, and that is where there is clear showing of a meritorious defense, which was not before the court in the original suit, and which, had it entered into consideration, would probably have defeated the patent or claim. It is under this exception that the defendants assert their right to oppose this motion, and their affidavits are directed to proving an invention and use by Henry Goebel prior to that of Edison. Although sundry other claims of priority have been set aside by the court in the course of the litigation, this one was not presented, and the defendants have a right to their day in court for its hearing. The question is whether there is such clear showing of merit for this claim now asserted, that the defendants should be relieved from the general rule by denying in their case the usual injunctional order; and the primary inquiry is what must be the measure of proof demanded. Must it be of the quality and quantity required to defeat the patent at final hearing—"clear, convincing and beyond reasonable doubt"—as held by Judge Colt; or will it suffice for denial of the motion, that it shows "a defense which puts the case in doubt," as held by Judge Hallett? It is clear that the presumption must be in favor of the patent, and that it cannot be overthrown by a mere doubt. I think the true test for proof upon the motion is that it shall be sufficient to raise a presumption that it would have defeated the patent had it been produced at the trial."

Then follow a few bits of history, in which several facts concerning the original testimony already well known to the electrical public are reviewed.

"As to the improbabilities of his discovery so long undiscovered," continues Judge Seaman, "it is sufficient to refer to the comments in the opinions in Telephone Cases, 126 U. S., 556; in American Company *vs.* American Cushman Company, 35 Fed. Rep., 735, and American Company *vs.* People's Company, 22 Fed. Rep., 309, as well applicable here, I will refer to some of the doubts raised, upon the defendant's showing, as to the actual components of these alleged Goebel lamps, remarking that the testimony of the numerous witnesses, however honest, speaking of such delicate structures seen by them many years ago, cannot justly be accepted as absolute verity.

"The fundamental thread-like carbon burner of Edison only became necessary as a means to subdivision of electric light, which was not contemplated by Goebel. The latter operated with a primary battery, for which the larger 'pencil' form of carbon or other material would answer as well, would be more stable and more easily made. This filament is most delicate and difficult to make, and must have a high vacuum or it will be instantly consumed. It seems unnecessary and undesirable for his purpose, and no satisfactory reason is given for its adoption by him.

The Goebel lamps are not shown to have had the high vacuum required for anticipation. His principal statement must be taken that he exhausted his lamps by the Torricellian method in the years prior to 1879, and I think it is abundantly shown, although not without some contradiction, that such a method could not produce the vacuum necessary to prevent disintegration of the carbon; and it seems doubtful whether it could be employed at all with this delicate carbon in the receiver. If that vacuum was wanting, the claim fails."

Concerning the improbability of the manufacture of practical lamps, the Judge says, in conclusion:

"After Goebel's employment in lamp making by the American Company, his claim of anticipation received some attention, and he had negotiations with one Dreyer, in 1882, for arranging a company to exploit the claim. It failed because he was then, apparently, unable to produce an original lamp. Later it was investigated by eminent patent lawyers, at various times, and, apparently, with great care and interest, to employ it in defenses against this patent, and also by one in behalf of complainant, and all rejected it as not well founded. Professor Thomson, of the Thomson-Houston Company, investigated it in 1882, when it would have been of vital interest to his company to make use of it against this patent, if tenable, and, after visiting Goebel, he rejected its consideration. Dr. O. A. Moses, an inventor with similar object, visited Goebel frequently, but came to the same conclusion, and says he was unable to produce any lamp. These are potent circumstances to raise doubt.

"Coming to the new testimony produced for this hearing, and which I have carefully considered, I find that the depositions of defendants are mostly cumulative, or in rebuttal of certain new affidavits produced by the complainant, and not here considered, but I cannot find that they remove any of the doubts above noted.

"On the other hand, affidavits now produced by complainants tend to show an admission by defendants' witness, Henry Goebel, Jr. (a son of the claimant), that he manufactured exhibit lamps Nos. 1, 2 and 3, in 1892, for the purpose of this case. There is no denial of this, but it is claimed that this son is venal, and has deserted the defense to favor the complainant. One Heger, a glass blower, swears that he made for Goebel while working with him (in the early eighties) lamps similar to No. 4, and he thinks he made this one at that time. As to a planer, which was produced by Goebel, as made by him at an early day, to cut bamboo for his carbon burners, one Korwan and Heger swear that it was actually made by the former in 1883. This is contradicted as to date by an affidavit produced by defendants.

"Upon the whole showing, I am satisfied that the complainants are legally entitled to preliminary injunction, and that it is the duty of the court to grant it without evasion. As stated by Judge Colt, and often held, a bond by defendant is not the equivalent of the injunction which the law gives for the protection of the inventor in the exclusive privileges promised by his patent.

"Injunction will therefore issue, but with leave to defendants to move for requirement of a bond by complainants to indemnify the defendants for any damages that they may suffer if it shall be finally held that the patent is invalid."

It will be seen that this verdict is more in the way of a compromise, and the attorneys for the defense seem to be sorry that the result was not more decided. An appeal will be taken by the defense.

KINDRED INTERESTS

The Schultz Gas Fixture and Art Metal Company, Baltimore, Md., have published a very tasteful brochure giving World's Fair information and advertising the company's business.

The Railway Equipment Company, Pullman Building, Chicago, dealers in electric railway supplies exclusively, have sent out circulars describing the Garton lightning arrester and improved trolley line devices.

"Railway Apparatus" is the title of a very artistic catalogue put forth by the Westinghouse Electric and Manufacturing Company, of Pittsburgh. It describes by concise text and fine illustrations the latest products of this well known company in the line of electric railway apparatus.

The Crocker-Wheeler Electric Company, New York, manufacturers and electrical engineers, illustrate and describe their well known power motors, fan motors, dynamos, direct current transformers, electric machine tools and other products in a very artistic catalogue which has just been received.

Otis Brothers & Company, 38 Park Row, New York, builders of the well known Otis elevators, have published a very tasteful catalogue describing the Otis electric pumps. The design and construction of this apparatus is of the latest and most approved character. The catalogue will prove of value to any one interested.

George Cutter, "The Rookery," Chicago, Ill., has issued a well prepared pamphlet, entitled "The Why and What of George Cutter's Headquarters," being a succinct description of that immense office building, "The Rookery," and telling of George Cutter's splendid facilities for doing business in high grade electrical specialties.

The New Gunboat "Machias," in her recent speed trial, accomplished the unprecedented feat of beating her guaranteed speed by nearly two and one-half knots, winning $45,000 premium for her builders. The boilers, steam pipes, etc., of this boat are covered with the asbestos fire-felt covering made by the H. W. Johns Manufacturing Company, 87 Maiden lane, New York.

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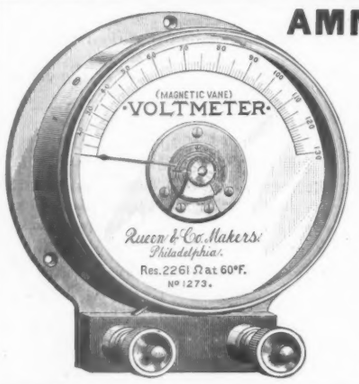

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